Nutrición Hospitalaria

Nutr Hosp. 2011;26(4):843-850
ISSN 0212-1611 • CODEN NUHOEQ
S.V.R. 318

Original

Reduction of vitamin A deficiency and anemia in pregnancy after implementing proposed prenatal nutritional assistance

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Abstract

Introduction: **Micronutrient deficiency is an unquestionable public health problem, specially anemia and vitamin A deficiency (VAD). This is due to the collective dimension of these carencies, which reflects on morbimortality rates in the maternal and infant group.**

Objective: **to evaluate the impact of a proposal for prenatal nutritional assistance, comparing the prevalence of anemia and VAD, in pre-intervention (GI) and intervention (GII) groups.**

Methods: **this is a prospective intervention study in a cohort of pregnant women. The GI group was made up of 225 the GII group of 208 pregnant adults and their respective newborns, attended a Public Maternity Ward in Rio de Janeiro, Brazil. Concentration of hemoglobin was used to diagnose anemia and a standardized interview to diagnose night blindness (XN).**

Results and conclusion: **after adjusting for confounding variables, through logistic regression, the protective effect of intervention at the onset of anemia (OR = 0.420; IC 95% = 0.251-0.702), with a significant reduction in prevalence, of 28.4% in the GI to 16.8% in the GII, also observed at the onset of XN (OR = 0.377; IC95% = 0.187-0.759), with a reduction in prevalence of 18.7 % in the GI to 6.2% in the GII. Nutritional intervention has a beneficial effect on maternal health, reducing nutritional deficiencies most prevalent during pregnancy and the impact of these on the obstetric ailment.**

(*Nutr Hosp.* 2011;26:843-850)

DOI:10.3305/nh.2011.26.4.5053

Key words: *Vitamin A deficiency. Night blindness. Anemia. Pregnancy. Nutritional intervention. Cohort study.*

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Recibido: 4-V-2010.
1.ª Revisión: 9-X-2010.
Aceptado: 16-XI-2010.

REDUCCIÓN DE AVITAMINOSIS A Y ANEMIA EN EL EMBARAZO DESPUÉS DE LA IMPLEMENTACIÓN PROPUESTA DE ASISTENCIA NUTRICIONAL PRENATAL

Resumen

Introducción: **La deficiencia de micronutrientes es un problema de indudable de salud pública, especialmente la anemia y deficiencia de vitamina A (DVA). Esto es debido a la dimensión colectiva de estos carencies, que se refleja en las tasas de morbi-mortalidad en el grupo materno-infantil.**

Objetivo: **Evaluar el impacto de un proyecto de atención nutricional prenatal, comparando la prevalencia de anemia y DVA, en la pre-intervención (GI) y la intervención (GII).**

Métodos: **se trata de una intervención prospectiva de un grupo de mujeres embarazadas. El GI consistió de 225 mujeres en el posparto y GII en 208 mujeres embarazadas y sus recién nacidos inscritos en una maternidad pública de Rio de Janeiro, Brasil. Se utilizó la concentración de hemoglobina en el diagnóstico de la anemia durante el embarazo y la entrevista estandarizada para diagnosticar la ceguera nocturna (XN).**

Resultados y conclusión: **Tras ajustar por variables de confusión, por la regresión logística, se verificó el efecto protector de la intervención sobre la anemia (OR = 0,420, 95% CI = 0.251-0.702), con reducción significativa en la prevalencia, 28,4 en el GI y 16,8% en el GII, que también se observó en los resultados XN (OR = 0,377, IC del 95% desde 0,187 hasta 0,759), con una reducción en la prevalencia, el 18,7% al 6,2% en el GI y GII. La intervención dietética tiene efectos beneficiosos sobre la salud materna, reducir las deficiencias nutricionales más prevalentes durante el embarazo y el impacto de estos sobre el resultado del embarazo.**

(*Nutr Hosp.* 2011;26:843-850)

DOI:10.3305/nh.2011.26.4.5053

Palabras clave: *Deficiencia de vitamina A. Ceguera nocturna. Anemia. Embarazo. Intervención dietética. Estudio de cohorte.*

Abbreviations

VAD: Vitamin A Deficiency.
XN: Night blindness.
UFRJ: Universidade Federal do Rio de Janeiro.
GI: Pre-intervention Group.
GII: Intervention Group.
MS: Ministério da Saúde.
OR: Odds Ratio.
CI: Confidence Intervals.
K: kappa.
ICC: Intra-class Correlation Coefficient.
BMI: Body Mass Index.
RDI: Recommended Daily Intake.
WHO: World Health Organization.
IVACG: International Vitamin A Consultative Group.

Introduction

In pregnant and nursing women, the implications of Vitamin A Deficiency (VAD) is seen in elevated rates of morbidity and maternal mortality, mainly due to infectious causes, such as those affecting the genitourinary, digestive and respiratory tracts.[1]

Night blindness (XN) is the first functional manifestation of VAD,[2-4] occurring mainly in pregnant women during the second and third trimesters of gestation.[5] It surfaces during lactation, generally during the third month post-partum.[6]

Gestational XN is highly prevalent in several regions of the world, with estimates at around 5 to 18%,[7] it is considered a public health problem when greater than 5%.[8] In Brazil, the first study to describe the prevalence of the functional manifestation of VAD in pregnant women presents significant findings, as nearly 18% of women in childbirth interviewed reported gestational XN.[3,4]

In developing countries it is estimated that the prevalence of iron deficiency anemia during gestation ranges from 35 to 75%, while in developed nations it is 19%.[9] In Brazil, the average prevalence of anemia in pregnant women is estimated at 30%.[10] Anemia is considered a public health problem when the prevalence of low concentrations of hemoglobin exceeds 5% of the population.[11]

Anemia caused by deficiencies in iron and folate may increase the risk of maternal death from cardiac arrest or aggravate pre and post-partum hemorrhage, loss of weight after giving birth, increasing the likelihood of premature birth and peri-natal mortality, mainly when it occurrs during the first half of gestation.[12]

Nutritional attention during prenatal assistance may help to prevent and treat the main nutritional deficiencies, justifying researchers' growing concern with acquiring a deeper understanding of nutritional intervention.[13,14]

In light of what was uncovered, the objective of the present study is to evaluate the effect of a prenatal nutritional assistance program in a cohort of pregnant women, comparing the prevalence of gestational anemia and VAD (gestational XN) in the pre-intervention and intervention groups.

Material and methods

Delineating the study

The study addresses intervention in a cohort of pregnant women. This study is one of the stages of the project entitled "Evaluation of the impact of prenatal nutritional assistance on obstetric ailments."

Study and data-collection groups

The population studied was made up of pregnant adult women attended to in the Maternidade Escola da Universidade Federal do Rio de Janeiro (UFRJ), presenting characteristics similar to the clientele of other Municipal Health Units (Saunders et al., 2004). Two study groups were defined: the pre-intervention group (GI, n = 225) and the intervention group (GII, n = 227). The criteria for inclusion: adults (age > 20 years), starting prenatal assistance up to the 16th week of pregnancy, single-fetus pregnancy, not bearers of illnesses prior to gestation and not users of nutritional supplementation containing vitamin A during pregnancy.

GII received intervention and was accompanied for 2 to 3 days after childbirth. The period of collection took place between June/05 and January/06. Taking into account that iron supplementation during pregnancy is a recommendation established by Ministério da Saúde (MS),[10,15,16] it was assumed that all pregnant women from the GI and GII received orientation on supplementation.

Intervention

The evaluations employed in this study are described in detail that follows.

Anthropometric evaluation: measurements of the mothers taken were height, declared pre-gestational weight or weight taken during first gestational trimester, current gestational weight and pre-partum weight. Weekly weight gain was calculated by subtracting current weight from the weight taken at last consultation, divided by the corresponding number of weeks. Total gestational weight gain was obtained by subtracting pre-partum weight (or from the last pre-partum consultation, having taken place the week of partum) from pre-gestational weight (declared or checked up to 13th week of pregnancy). Gestational weight gain was taken in accordance with recommendations from the MS.[17]

Biochemical evaluation: The dosage of hemoglobin for diagnosis of anemia was performed at the unit's Clinical Analysis Laboratory. It was considered anemia when the dosage of hemoglobin was less than 11 g/dl.[17] Hemoglobin concentrations were evaluated at least once every gestational trimester.

Functional evaluation: In the functional evaluation of the VAD, the presence of gestational XN was investigated by standardized testing[2,18] of the pregnant females, adapted and validated by Saunders et al.[3,4]

Socio-demographic evaluation: Mother's characteristics (age, marital status, level of schooling, sanitation conditions at home, family *per capita* income), by consulting patient dossier and direct interview. Identification of skin color was self-classified (white or other).

Nutritional care: Was performed by qualified researchers, periodically trained and supervised, who developed individualized diets, with detailed explanations based on a list of food substitutions, placing emphasis on healthy nourishment and food sources that are adequate and those fortified with iron and vitamin A. To meet recommended weekly intake of vitamin A, the pregnant women were asked to consume 1 medium-sized piece of bovine liver (100 g) during accompaniment, per week.

Information regarding prescription or use of vitamin-mineral supplements was obtained from medical records.

On data collection, in the GI the retrospective data referring to current gestation was collected at the time of partum and immediately thereafter, by way of direct interview and patient dossiers.[19] Individual consultation for pregnant women of the GII was performed in the nutrition waiting room and the pregnant/lactating women were evaluated in the doctor's hospital office.

Quality of data

In the pilot study, data-collection instruments were tested in 13.4% of the GI samples (n = 35) and in 12.3% of the GII samples (n = 28) and, thereafter, adjusted. The data collected at this stage was not incorporated into the study's final presentation.

To guarantee the quality of the data an *inter-evaluator reliability of application*[20] evaluation was performed. The GI performed the evaluation in 12.6% of the sample and the GII in 11% (n = 25).

Sample size and statistical analysis

To calculate the sample size for the original project, the significance level was established at 5%, the study power at 90% to detect a minimum difference of 15% between the two proportions (prevalence of gestational XN in GI and GII groups), for which an approximate prevalence of 20% was considered. Thus, with a of 5% and a b of 10%, the sample size calculated was of 197 for both groups (GI and GII). Estimating that there was a drop-out loss of 15%, the sample size for the GII included 15 more women, coming to a total minimum sample size of 115 for this group.[21]

In the exploratory analysis of data, outliers (+ 3 standard deviance) were excluded from total gestational weight gain variables (n = 6: 30 kg, 30.3 kg, -4 kg, -3 kg, 29.4 kg, 33.7 kg) and number of pregnancies (n = 7: 7, 7, 8, 9, 7, 8, 7), with the aim of obtaining more homogenous samples.

For quantitative variables, measurements of central tendency and dispersion were calculated and the T-Student test was employed in comparing group averages. To verify association between categorical variables the chi-square test was applied. In all analysis a significance level of 5% was considered.

To compare ailment —anemia and maternal night blindness during pregnancy— variables, taken into account at any point in the pregnancy, logistical regression models were used, calculating the odds ratio (OR) and confidence intervals (CI) of 95%, for bivariate analysis (unadjusted ORs) and for multivariate analysis (adjusted ORs), with controls for possible confounding factors. Considered to be potential confounding factors were all the variables presenting an association with ailments of a significance level of 20%.

To evaluate inter-observer agreement on categorical variables, the *kappa* (k) statistic was employed. The Intra-class Correlation Coefficient (ICC) was calculated to evaluate continuous and ordinal variable concordance.[22] $K > 0.61$ was considered to be good concordance[23]. All analysis was performed on the SPSS *for windows* statistical package version 10.

Ethical questions

The study was planned respecting ethical questions raised by Conselho Nacional de Saúde[24] and the original project was approved by Comitê de Ética do Instituto de Puericultura e Pediatria Martagão Gesteira (UFRJ). All participants signed an informed consent form.

Results

The final sample of the study consisted of 225 in GI and 227 in GII groups.

Loss from dropout of the GII was 8.4% (n = 19). Comparing the characteristics of the pregnant women who dropped out with those who remained in the study, there was no difference in maternal age (p = 0.731); family *per capita* income (p = 0.623); number of pregnancies (p = 0.316); parity (p = 0.350); number of abortions (p = 0.828); Pre-gestational Body Mass Index (BMI) (p = 0.447). The similarity between the groups of pregnant women included in the study or considered

Table I
Anthropometric characteristics and socio-demographics of pré-intervention (GI) and intervention (GII) groups. (Maternidade Escola/UFRJ, Rio de Janeiro)

Mother characteristics	*GI (%) n = 225*	*GII (%) n = 208*	*p*
Pre-gestational state of nutrition (BMI/kg²)			
Low weight (< 19.8)	19.3	13.1	0.321
Normal (19.8-26)	61.3	68.4	
Overweight (> 26-29)	10.4	10.7	
Obese (>29)	9.0	7.8	
Color			
White	44.4	37.2	0.126
Other	55.6	62.8	
Marital status			
Married/lives with partner	67.6	88.0	< 0.001
Single, divorced or widowed	32.4	12.0	
Level of schooling			
Basic schooling complete	49.1	50.9	0.095
Basic schooling imcomplete	57.6	42.4	
Sanitary conditions at home			
Adequate*	93.8	98.6	0.011
Inadequate	6.2	1.4	

*When treated water and plumbing, sewage system and regular trash collection is present, inadequate being a lack of such services.

Table II
Averages and deviations for standard maternal characteristics of pré-intervention (GI) and intervention (GII) groups. (Maternidade Escola/UFRJ, Rio de Janeiro)

Characteristics	*No.*	*Average*	*Standard deviation*	*p*
Mother's age (years)				
GI	225	27.08	5.30	0.548
GII	208	27.37	4.80	
Total family income (minimum salaries)				
GI	197	4.96	4.10	0.049
GII	203	4.22	3.23	
Pre-gestational BMI (kg/ m²)				
GI	212	23.09	3.80	0.425
GII	206	23.39	3.80	
Total gestational weight gain (kg)				
GI	210	12.63	5.80	0.157
GII	208	13.35	4.50	
Number of pregnancies				
GI	225	2.54	1.71	< 0.001
GII	208	1.95	1.08	
Number of prenatal assistance consultations				
GI	225	7.52	2.79	< 0.001
GII	206	9.03	1.74	
Number of prenatal nutritional care consultations				
GI	225	0.56	1.35	< 0.001
GII	208	4.12	1.67	

losses were also revealed in categorized variables – marital status (p = 0.953); skin color (0.554); sanitation conditions at home (p = 0.610); classification of the pre-gestational BMI (p = 0.238). A greater proportion of women with a higher level of schooling was noted in the dropout group (p = 0.02)

The socio-demographic characteristics of the women studied are described in table I, according to the study groups. In analyzing the maternal characteristics, whether the GII had a greater proportion of married women or if they live with a partner and have better sanitary conditions at home was checked. As for skin color characteristics, pre-pregnancy BMI and level of schooling, similarity was noted between the groups (table I).

Similarities were also identified between averages in the GI and GII according to the characteristics of maternal age, total family income, pre-pregnancy BMI and total weight gain during pregnancy; the averages were found to be similar (table II). Not withstanding, a greater number of pregnant women in the GI and an increase in the average number of prenatal consultations in the GII were noted (table II).

The number of prenatal assistance consultations increased from 0.56 in the GI to 4.12 in the GII, compatible with the minimum calendar of 4 nutritionist consultations, extolled in the present study (table II).

On the quality of data, analyzing the inter-evaluating concordance indicators it was ascertained that there was standardization in the procedures for obtaining information in both groups, having found for the GI the ICC (> 0.92) and *k* (> 0.65) values and for the GII indicators of ICC > 0.94 and *k* > 0.71, with the ailment variables standing out – hemoglobin (ICC = 1.0) and night blindness during pregnancy (*k* = 1.0).

Anemia was the most prevalent gestational intercurrence in the GI (28.4%) (table III). In the case of the GII, prevalence of anemia throughout pregnancy was 16.8%.

As for evaluation of the impact of nutritional intervention on XN, its initial prevalence, or in other words, that described for the GI, was of 18.7%, while after implementation of the prenatal nutritional assistance program (intervention) a significant reduction of this indicator was registered, as only 6.2% of GII integrants presented the said ocular symptom of VAD (table III).

After adjustment for confounding variables, controlling the effect of co-variables that in bivariate analysis showed an association (p < 020) for the ailments *anemia* (marital status, number of prenatal assistance consultations, income, age, adjustment to weight gain) and *night blindness during pregnancy* (sanitation, number of pregnancies, number of abortions, number of prena-

Table III
Prevalence and result of logistical regression for anemia and gestational night blindness by study groups (GI = 225, GII = 208) (Maternidade Escola/UFRJ, Río de Janeiro)

Ailment	%	Bivariate analysis			Multivariate analysis		
		OR Unadj.	IC 95%	p	OR Adjusted*	IC 95%	p
Anemia							
GI (n = 64)	28.4	1.0	–	–	1.0	–	–
GII (n = 35)[a]	16.8	0.492	0.303-0.798	0.004	0.420	0.251-0.702	0.001
Night blindness							
GI (n = 42)	18.7	1.0	–	–	1.0	–	–
GII (n = 13)[b]	6.2	0.292	0.152-0.562	0.000	0.377	0.187-0.759	0.006

OR: odds ratio; IC 95%: Confidence Interval 95%.
*OR: adjusted to following variables:
[a]Anemia - marital status, number of prenatal care consultations, total family income, age, adaption to weight gain.
[b]Night blindness - sanitation, pregnancy, abortion, number of prenatal care consultations.

tal assistance consultations), intervention was shown to have a protective effect over both ailments (table III).

In respect to the use of iron supplementation during pre-childbirth, all the pregnant women studied received orientation based on recommendations of MS, in force at the time of collection. During consultations at the Nutrition ward, the pregnant females received orientation on the importance of adhering to medical supplementation prescriptions during the term of pregnancy.

For all the pregnant women in the GI, iron supplementation for preventing anemia was administered starting in the 20th week of pregnancy, using one capsule of iron sulfate/day (300 mg), equivalent of 60 mg of elementary iron. Prescription of specific-treatment doses were suggested in cases where hemoglobin concentrations were lower than 11 g/dl, accompanied by parasitologic testing.[15,16]

For pregnant women in the GII, iron supplementation was performed according to orientation available in the MS manual,[10] which maintains the previously established recommendation (60 mg of elementary iron/day) and includes folic acid supplementation (5 mg/day), up to the final day of pregnancy.

Discussion

The pioneering nature of this study should be highlighted, as up to now there are no studies in Brazil that evaluate the impact of nutritional intervention in reducing these nutritional deficiencies in pregnant women, demonstrating the importance of these results for the segment of the population studied.

At the time when samples were collected, the difficulties that arose were similar to those generally encountered in studies of this nature: missed consultations, difficulty in locating the pregnant women, due to change of address and contact information originally provided, need to locate pregnant women's records to be able to assist them, long waiting times for appointment with nutritionist.

In spite of the limitations mentioned, the percentage of drop out loss in the cohort (GII) was low (8.4%) when compared to other studies,[12,25] and it is worth pointing out there was no significant statistical difference between the association of variables of the women in the study and those defined as loss. Such findings may reflect the effectiveness of the strategies to prevent drop out, the improvement in the quality of data and may suggest that losses did not influence the study's outcome.

It is noteworthy that supplementation with vitamin A was an exclusion criteria, in order to ensure the homogeneity of the groups.

In relation to the reproducibility of the information collected, good indicators of concordance were checked among interviewers, making evident standardization in procedures for obtaining reliable data, in view of theoretical-practical training, periodic retraining, supervision, checking how research for MS have been filled out, maintenance of full-time team, integration between researchers and drawing up instruction manuals for correct form filling. The quality of data should be a concern of researchers, so as not to compromise the validity of results encountered and impede its extrapolation to the population studied.

Anemia was the nutritional deficiency most prevalent in both groups studied (table III). This result demonstrates how anemia during pregnancy is a health problem in the population studied.

Nevertheless, the lower prevalence of this deficiency in the GII, when compared to that of the GI and the national average estimated by the MS,[10] suggests the nutritional intervention proposed in the present study, based on detailed nutritional evaluation, can be effective in remedying this problem.

The prevalence of anemia found in this study was also lower than that described in other studies. In Brazil, Vitolo et al.[26] found 31.6% of pregnant women to have anemia in Rio Grande do Sul. Agarwal et al.[27] found 84% of pregnant women to have anemia in India.

As previously mentioned, in respect to the use of iron supplementation during pre-childbirth, all the pregnant women studied received orientation based on recommendations of MS, in force at the time of collection.[10,15,16] Thus, the recommendation of folic acid supplementation was not adopted in the GI. Because there is no information on adherence to supplementation, this variable did not enter the analysis, being considered a coverage of 100%. In GII, 41.3% of pregnant women used folic acid supplementation.

The main causes of anemia are inadequate ingestion of iron and damaged dietary bioavailability of this mineral,[28] set off by substances present in the same meal that interfere with its assimilation, like poliphenols, tannins, phytates and calcium. Nevertheless, the recommended daily intake (RDI) for pregnant women is rarely met by diet alone.

According to Shobeiri et al.,[29] in a study carried out on pregnant women in India, dietary ingestion of iron during pregnancy was approximately 60% of that recommended. Corroborating with these findings, in the present study anemia in the GII women was more prevalent during the second trimester of gestation. The drop in hemoglobin concentrations, due to physiological anemia in the first gestational trimester, reaches lower levels at around the 25th week (second trimester), again suffering an elevation in the 3rd trimester, when the tendency is to equal the levels found during the initial phase of pregnancy.[30] This reduction in hemoglobin and hematocrit concentrations favor placental perfusion[31], contributing to fetal development.

This result reflects the importance of carrying out nutritional evaluation as early as possible, allowing for the identification of dietary problems that may reduce the bioavailability of iron. Nutritional evaluation should emphasize consumption of food rich in iron, fortified foods, dietary diversification during pregnancy[32] and stimulate the pregnant woman to adhere to intervention strategies suggested by the MS[10,17] that take into consideration, beyond performing parasitological testing, a plan for supplementing iron and folic acid, starting in the twentieth week of pregnancy.

In this study, as recommended by the MS,[17] the choice of hemoglobin as an indicator for diagnosing anemia during pregnancy is due to its ample use because of its low cost, its operational ease and consequent appropriateness for prenatal assistance's basic routine.

Evaluation regarding the other ailment of interest, VAD, diagnosed using standardized interviews for investigating XN during pregnancy, revealed a prevalence of 18.7% and 6.2% in the GI and GII groups, respectively. This data is consistent with data observed in several regions of the world, whereby VAD during pregnancy is shown to have a prevalence of 5 to 18%.[3,4,7]

These results catch attention due to a decrease in the prevalence of XN of approximately one third, in relation to the group that did not receive the intervention. This demonstrates how prenatal nutritional assistance can significantly improve the outlook for chronic VAD and its consequences, keeping in mind that women showing signs of XN have 4 to 6 times greater likelihood of experiencing again such ocular symptoms in subsequent pregnancies and have 10 times the likelihood of developing XN during the first months following childbirth,[6] as well as 5 times greater likelihood of dying from complications related to infection and their children present greater child mortality rates up to the sixth month, as compared to women not suffering from XN.[8] One can also infer that, in the GI, the parturients with the lowest number of prenatal consultations or with a history of miscarriage, were most susceptible to developing gestational XN.[3]

The method chosen to investigate XN was interview because it is quick to apply, low cost, does not require ophthalmologic knowledge and is recommended for pregnant women by the World Health Organization (WHO).[2] Furthermore, it was validated according to the biochemical indicator (level of serum retinol), by Saunders et al.,[3,4] for the group in question. In this way, the XN investigation through the use of that method is a promising indicator for the nutritional state of vitamin A in the mother-child group, as it is easily incorporated into health routines for preventing and controlling VAD.[33]

At present, the WHO and the *International Vitamin A Consultative Group* (IVACG)[8] recommend supplementation with daily doses of 10,000 IU or weekly doses of 25,000 IU of vitamin A for 4 to 8 weeks to prevent and treat gestational XN, without the risk of teratogenicity. In the present study, the strategy adopted for prevention and treatment of gestational XN was dietary diversification and encouraging consumption of fortified foods.

Dietary diversification was recommended with the aim of increasing the availability of nutrients.[34] Modification of the dietary standard, along with consumption of fortified foods, are complementary efforts that take into account the shorter time needed to reverse the scope of deficiency through consumption of enriched foods, along with the promotion of change in eating habits, through dietary re-education, which benefits both the pregnant woman and her family, as women at reproductive age are responsible for feeding the family and, therefore, are opinion makers.

The beneficial effect of prenatal assistance on obstetric results has been demonstrated by several authors[3,35,36] and corroborated by the results here described. It is worth pointing out that the increase in the number of prenatal nutritional assistance consultations, in line with the assistance protocol proposed in the present study, having been so well received by the

team at the prenatal care unit, may have influenced a greater number of pregnant women to appear at their consultations with the nutritionist. The utilization of nutritional counseling principles, contributing to the proposal being so well received and the creation of a health care professional-pregnant woman bond, also may have contributed, as a form of incentive for the pregnant women to adhere to the program and nutritional care geared towards educational practices and prophylactic measures objectifying the prevention and treatment of nutritional deficiencies common during gestation, they complement each other to improve the mother-child state of health and nutrition.

Given the results presented, the technical and economic viability of incorporating the intervention proposed and applied in this study —prenatal nutritional assistance— to routine prenatal assistance in public health wards is clear, as it introduced easy and low-cost methodology, which does not result in extra expense to public services.

The study presents as a limitation not having performed the evaluation of adherence to the use of iron supplementation during gestation, nevertheless, it was taken into account that all the participant pregnant women in the study received orientation on using this supplement, as well as on the importance of this intervention strategy.

Conclusion

Prenatal nutritional assistance, initiated concomitant to prenatal assistance and extended throughout the pregnancy, is fundamental in promoting healthy dietary habits and even a healthy lifestyle in this group that stands out for its receptivity to change, benefiting both the pregnant female and the newborn.

Acknowledgements

This study was developed with help from research promoting bodies (Conselho Nacional de Desenvolvimento Científico e Tecnológico —CNPq— edital 51/2005) and with scientific startup grants (Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro - FAPERJ, CNPq, PIBIC/UFRJ). We would like to thank the statistician Paulo Borges for his statistical analysis.

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