PREVALENCE OF INADEQUACY IN NUTRIENT CONSUMPTION AMONG PREGNANT WOMEN ATTENDED IN BASIC HEALTH UNITS

Prevalência da inadequação no consumo de nutrientes entre gestantes atendidas em unidades básicas de saúde

Prevalencia de la inadecuación del consumo de nutrientes por embarazadas asistidas en unidades básicas de salud

Original Article

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ABSTRACT

Objective: To assess the dietary intake of pregnant women attended in Basic Health Units of Picos-Piauí. **Methods:** Cross-sectional study involving 72 pregnant women. Sociodemographic and lifestyle data was collected, plus information on dietary intake from three 24-hour food recalls. The prevalence of inadequacy for carbohydrate, calcium, iron, A, C, E vitamins, and folate were calculated based on their respective estimated average requirements (EAR), while the adequacy of habitual energy intake relative to usual energy expenditure was estimated indirectly by body mass index (BMI). **Results:** It was found that 86.1% of the pregnant women had a per capita income lower than one minimum wage, 4.2% were smokers and 11.1% used alcohol during pregnancy. As regards consumption, carbohydrates and vitamin C had inadequacy prevalence lower than 2%, while vitamin A ranged from 30 to 50%. Calcium, iron, folate, and vitamin E had inadequacy prevalence higher than 98%. Considering that 38.9% of the pregnant women were overweight and 4.2%, underweight, it is assumed that the prevalence of energy intake inadequacy is high. **Conclusion:** There was a high inadequacy prevalence in the micronutrients calcium, iron, folate, and vitamin E intake in pregnant women, as well as high inadequacy of energy consumption – a disturbing situation, since it can trigger adverse consequences for the mother-baby binomial.

Descriptors: Pregnant Women; Food Consumption; Nutrients; Nutritional Status; Nutritional Requirements.

RESUMO

Objetivo: *Avaliar a prevalência da inadequação no consumo de nutrientes entre gestantes atendidas em Unidades Básicas de Saúde de Picos-PI, Brasil.* **Métodos:** *Estudo transversal envolvendo 72 gestantes. Coletaram-se dados sociodemográficos e de estilo de vida, além de informações sobre ingestão dietética, a partir de 3 recordatórios alimentares de 24 horas. Calcularam-se prevalências de inadequação para carboidrato, cálcio, ferro, vitaminas A, C, E e ácido fólico, baseando-se em suas respectivas médias estimadas (EAR); avaliou-se a adequação da ingestão energética habitual em relação ao gasto energético usual indiretamente pelo índice de massa corporal (IMC).* **Resultados:** *Verificou-se que 86,1% (n=62) das gestantes apresentavam renda per capita inferior a 1 salário mínimo, 4,2% (n=3) fumavam e 11,1% (n=8) faziam uso de bebida alcoólica durante a gestação. No que se refere ao consumo, os carboidratos e a vitamina C tiveram prevalência de inadequação menor que 2%, enquanto a vitamina A ficou entre 30% e 50%. Cálcio, ferro, ácido fólico e vitamina E tiveram prevalência de inadequação maior que 98%. Ao considerar que 38,9% (n=28) das gestantes estavam com excesso de peso e 4,2% (n=3), com baixo peso, presume-se elevada prevalência de consumo inadequado de energia.* **Conclusão:** *Houve elevada prevalência de inadequação no consumo dos micronutrientes cálcio, ferro, ácido fólico e vitamina E nas gestantes, além de inadequação de consumo energético – situação preocupante, visto que pode desencadear consequências adversas para o binômio mãe-filho.*

Descritores: *Gestantes; Consumo Alimentar; Nutrientes; Estado Nutricional; Necessidades Nutricionais.*

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RESUMEN

Objetivo: Evaluar la prevalencia de la inadecuación del consumo de nutrientes por embarazadas asistidas en Unidades Básicas de Salud de Picos-PI, Brasil. **Métodos:** Estudio transversal con 72 embarazadas. Se recogieron datos sociodemográficos, del estilo de vida e informaciones sobre ingesta dietética a partir de 3 recordatorios de 24 horas. Se calculó las prevalencias de inadecuación para carbohidrato, calcio, hierro, vitaminas A, C, E y ácido fólico basándose en sus respectivas medias estimadas (EAR); se evaluó la adecuación de ingesta energética habitual respecto al gasto energético usual de modo indirecto a través del índice de masa corporal (IMC). **Resultados:** Se verificó que el 86,1% (n=62) de las embarazadas presentaban renta *per capita* menor que 1 sueldo mínimo, el 4,2% (n=3) fumaban y el 11,1% (n=8) tomaban bebida alcohólica en el embarazo. Respecto al consumo, los carbohidratos y la vitamina C tuvieron prevalencia de inadecuación menor que el 2% mientras que la vitamina A se quedó entre el 30% y el 50%. Calcio, hierro, ácido fólico y vitamina E tuvieron prevalencia de inadecuación mayor que el 98%. Considerando que el 38,9% (n=28) de las embarazadas tenían exceso de peso y el 4,2% (n=3) bajo peso, presúmase de elevada prevalencia del consumo inadecuado de energía. **Conclusión:** Hubo elevada prevalencia de inadecuación del consumo de los micronutrientes calcio, hierro, ácido fólico y vitamina E en las embarazadas además de la inadecuación del consumo energético – situación preocupante ya que puede desencadenar consecuencias adversas para el binomio madre-hijo.

Descriptores: *Mujeres Embarazadas; Consumo de Alimentos; Nutrimentos; Estado Nutricional; Necessidades Nutricionales.*

INTRODUCTION

Evidence suggests that healthy behaviors during pregnancy such as appropriate dietary intake, physical activity, appropriate weight gain and the non-abuse of substances like alcohol and tobacco can contribute to the good health of mother and baby[1,2]. On the other hand, inappropriate maternal nutrition has been associated with preterm births and intrauterine growth restriction[1-3].

Thus, maternal nutritional status, before and during pregnancy, is a strong determinant of pregnancy outcome and health of mother and newborn[1,3]. It is understood that inappropriate energy intake during pregnancy might impair fetal growth, and micronutrient deficiency may have adverse consequences for the pregnant woman and fetal development[3,4].

Within this context, it is important to assess food intake in pregnant women – although such assessment may not be a direct indicator of nutritional status – as it helps in the nutrition diagnosis, making it possible to spot subclinical risks for unfavorable outcomes of pregnancy such as preterm birth, low birth weight, gestational diabetes mellitus, pre-eclampsia, among others, constituting, therefore, the first nutritional risk indicator[5,6].

Despite the relevance of food intake, there is no other study to identify food and nutrition situations of pregnant women in the State of Piauí. In an attempt to fill this gap, the present study aimed to assess the prevalence of nutrient intake inadequacy in pregnant women assisted in *Unidades Básicas de Saúde* (Basic Health Units) of Picos, Piauí.

METHODS

This is a cross-sectional, observational study conducted with pregnant women assisted in *Unidades Básicas de Saúde – UBS* (Basic Health Units) of the municipality of Picos, Piauí in the period from March to May 2011.

The study included pregnant women from the five UBS with the largest number of prenatal consultations – an average of 19 adult pregnant women attending consultations every month in each UBS. Of a total of 95 pregnant women assisted in this period, 76 (80% of the study population) women who were in the waiting room for prenatal consultation or examination were included. Women aged over twenty at any stage of pregnancy were eligible for participating in the research. Pregnant women at risk (hypertension, diabetes, twin pregnancy, etc.) and with mental disorders were excluded from the study.

Of the 76 eligible women, only 72 (94.7%) completed all the steps. One quit the study, two did not answer one of the 24-hour diet recalls and one did not answer the socioeconomic questionnaire appropriately.

After reading the Free Informed Consent Form, the previously trained team of Nutrition undergraduate students applied the instruments.

First, socio-demographic information (marital status, maternal occupation, maternal education, maternal age, gestational age and income per capita) and lifestyle data (smoking and drinking) were collected. Then, information on the food intake of the pregnant women was obtained through the application of three 24-hour diet recall interviews (24HRs) on alternate days, including one day on the weekend. To do so, a self-made formulary in combination with a photograph album with pictures of food servings and kitchen utensils were used to collect information about meal times, food, preparation and servings. Data on the use of food supplements were not included in the study.

Nutrient intake was assessed with the help of Nutwin 2002 software, version 1.2, of the *Universidade Federal de São Paulo*[7] (Federal University of São Paulo). The food that was not in the program was included from the *Tabela Brasileira de Composição de Alimentos*[8] (Brazilian Food Composition Table).

The prevalence of macronutrient and micronutrient inadequacy were analyzed based on the values of the Dietary Reference Intakes (DRI) proposed by the Food and Nutrition Board (FNB)[9] and the sample was gathered into one group because the reference values recommended for pregnant women aged 19-30 and 31-50 are the same for all the macronutrients and micronutrients assessed. Prevalence of inadequate intake of carbohydrates, calcium, iron, vitamin A, vitamin C, vitamin E and folic acid was calculated based on their respective estimated average requirements (EAR) [9,10].

In order to estimate the prevalence of current intake inadequacy, an adjustment considering the intrapersonal variation proposed by the Institute of Medicine (IOM) [9] was previously made using the analysis of variance (ANOVA) with a classification factor[11].

Energy intake inadequacy was assessed using the Body Mass Index (BMI), considered by the IOM the best indicator for such analysis. To do so, eutrophic BMI values in the range 18.5-24.9 kg/m^2 (for adults) indicated adequate energy intake in relation to expenditure. BMI values below normal ranges indicated inadequate energy intake; values above normal ranges indicated excess energy intake.

Pre-gestational state was classified according to the BMI for adult women: *low weight* BMI < 18.5 kg/m^2, *eutrophic* BMI between 18.5 and 24.9 kg/m^2 and *excess weight* BMI ≥ 25.0 kg/m^2. Gestational state was classified according to the BMI proposed by the IOM[12]: *low weight* BMI < 19.8 kg/m^2, *eutrophic* BMI between 19.8 and 26.0 kg/m^2 and *excess weight* BMI > 26.0 kg/m^2. Pre-gestational weight and height were obtained from the information on the pregnant women's record card. Current/gestational weight was verified during the consultation with the pregnant woman wearing light clothes and standing on a digital scale with a capacity from 0 to 150 Kg and accuracy of 100 g.

Statistical analysis was performed using SPSS software, version 17.0, and the results were expressed as absolute and relative frequency.

Table I - Description of pregnant women assisted in *Unidades Básicas de Saúde* (Basic Health Units) according to socio-demographic characteristics and lifestyle. Picos-PI, 2011.

Characteristics		**n**	**%**
Marital status	Married/lives with partner	60	83.3
	Single/separated	12	16.7
Occupation	Yes	27	37.5
	No	45	62.5
Education	None	3	4.2
	Elementary school	15	20.9
	High school	43	59.7
	Higher education	11	15.3
Age group	20 – 34 years	68	94.4
	> 35 years	4	5.6
Gestational age	1st trimester	9	12.5
	2nd trimester	30	41.7
	3nd trimester	33	45.8
Income *per capita*	Up to R$ 200.00	32	44.4
	R$ 200.00 to R$ 545.00	30	41.7
	Above R$ 545.00*	10	13.9
Smoking during pregnancy	Yes	3	4.2
	No	69	95.8
Drinking during pregnancy	Yes	8	11.1
	No	64	88.9
Total		72	100.0

*Minimum wage R$ 545.00

The study was approved by the Research Ethics Committee of the *Universidade Federal do Piauí* (Federal University of Piauí) under Protocol No. 0462.0.045.000-10, and it is in accordance with Resolution 466/12[13].

RESULTS

The profile of pregnant women assisted in *Unidades Básicas de Saúde* (Basic Health Units) of Picos, Piauí, showed that 68 (94.4%) of them were aged 20-34 years and 33 (45.8%) were in the 3rd trimester of pregnancy (Table I).

Regarding socio-demographic characteristics and lifestyle, it was observed a high prevalence of common-law marriage (n=60; 83.3%), women who did not work outside the home (n=45; 62.5%) and income per capita of less than one minimum wage (n=62; 86.1%). Concerning education, there was a high percentage of pregnant women with high school education (n=43; 59.7%). Additionally, it was observed that 3 (4.2%) pregnant women smoked and 8 (11.1%) drank alcoholic beverages during pregnancy (Table I).

The prevalence of intake inadequacy in the study population (Table III) was estimated considering the energy and nutrient intake values adjusted by intrapersonal variation presented in Table II.

It was possible to observe that only carbohydrate and vitamin C intakes presented inadequacy lower than 2%. The prevalence of inadequate vitamin A intake ranged 30-50% while that of calcium, iron, vitamin E and folic acid was higher than 98% (Table III).

Figure 1 shows that circa 40% of the pregnant interviewees were over the ideal weight for the gestational age. It is assumed that the group assessed here presented a high prevalence of inadequate energy intake, with 4.2% (n=3) of low intake and 38.9% (n=28) of excess intake, according to the nutritional state during pregnancy.

Table II - Description of macro and micronutrient intake before and after adjustment by intrapersonal variation and respective variance ratios of food intake of pregnant women assisted in *Unidades Básicas de Saúde* (Basic Health Units). Picos, PI, 2011.

Nutrients	Unadjusted values				Adjusted values				
	Min	Max	Mean	SD	Min	Max	Mean	SD	Sb/ Sobs
Energy (kcal)	900.6	2699.4	1600.3	386.1					
Carbohydrate (g)	136.8	448.2	238.3	61.3	152.5	415.6	238.3	51.8	0.845
Proteins (g)	35.1	135.4	72.8	19.1	42.52	123.1	72.80	15.37	0.804
Lipids (g)	16.8	80.4	40.4	14.7	21.5	72.5	40.4	11.8	0.801
Calcium (mg)	151.9	885.1	419.5	175.2	192.3	814.8	419.5	148.7	0.849
Iron (mg)	5.9	19.7	12.8	3.2	7.7	17.9	12.8	2.4	0.737
Vitamin A (µg)	76.8	4324.2	622.2	827.2	399.7	2132.6	622.2	337.5	0.408
Vitamin E (mg)	0.9	7.8	3.3	1.5	1.5	6.7	3.3	1.1	0.761
Vitamin C (mg)	0.9	4121.1	502.4	781.8	375.6	1418.0	502.4	197.8	0.253
Folic acid (µg)	72.9	369.3	194.3	63.8	119.0	302.8	194.3	39.5	0.620

*Sb/Sobs: variance ratio

Table III - Description of pregnant women assisted in *Unidades Básicas de Saúde* (Basic Health Units) according to the prevalence of inadequate intake of macro and micronutrients. Picos, PI, 2011.

Nutrients	EAR (gestation 19-50 years)	z value	Prevalence of inadequacy
Carbohydrates (g)	135	2.0	< 2%
Calcium (mg)	800	-2.56	> 98%
Iron (mg)	22	-3.85	> 98%
Vitamin A (µg)	550	0.21	30 to 50%
Vitamin E (mg)	12	-7.82	> 98%
Vitamin C (mg)	70	2.19	< 2%
Folic acid (µg)	520	-8.24	> 98%

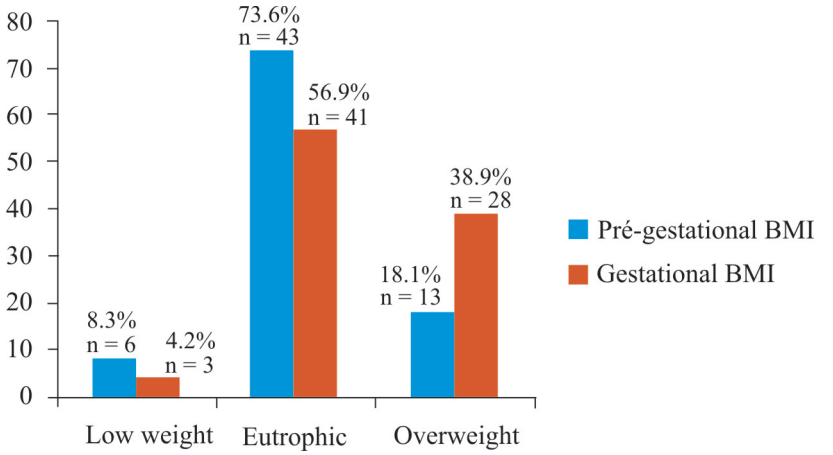

Figure I - Pre-gestational and gestational nutritional state of adult pregnant women assisted in *Unidades Básicas de Saúde* (Basic Health Units). Picos, PI, 2011 (n=72).
BMI=Body Mass Index.

DISCUSSION

It is known that normal fetal development and growth depend on biological, pathological and socioeconomic factors. Among the biological factors, the maternal age stands out; among pathological factors, mother's inadequate nutritional state sticks out; and among social factors, maternal education, family income and inadequate lifestyle, i.e., smoking and drinking are noticeable[6,14,15].

The results of this research show that pregnant women are mostly aged 20-34 years, a period considered excellent in terms of reproduction as the literature confirms that advanced maternal age increases the risk of perinatal morbidity and mortality[14,15]. As to social variables, it was observed a high prevalence of pregnant women with complete high school education and common-law marriage. These are protective factors for the occurrence of low birth weight newborns[16].

There was a high percentage of women with income per capita of less than one minimum wage. Literature shows that pregnant women with low purchasing power have a limited access to food and therefore eat high energy food, which is cheaper; however, it has a negative impact on maternal health and on the healthy fetal development[2,15]. It is important to highlight that most of the pregnant women assessed here belong to a low income per capita group, which may partially explain the high prevalence of overweight pregnant women[15].

Concerning lifestyle, an important percentage of pregnant women admitted to smoking and drinking during pregnancy. It is important to highlight that the use of substances harmful to health and the little healthy lifestyle during pregnancy and postpartum period, such as the use of licit and illicit drugs, should be assessed and discouraged as fetal growth restriction, abortion, preterm birth, cognitive deficit, infant mortality, and others, may be associated with these inappropriate behaviors[2,17].

In the present study, the number of pregnant women who admitted to drinking during pregnancy was significant; however, it is important to consider that the frequency of this consumption was not assessed and it could be an occasional behavior. This occasional consumption could reduce the prevalence of alcohol intake in the study population[18]; however, the data of the present study are in accordance with other research that shows a variation in the use of alcohol during pregnancy – from 2.0% to 20.4%. The consumption of alcohol during pregnancy may be associated with increased risk of low birth weight (OR = 4.20)[19, 20].

The unadjusted average calorie intake was 1600.3 kcal/day. The low calorie intake and the discrepancy with respect to the high prevalence of excess weight may be explained by the food intake underreporting. A study using the doubly labeled water technique, considered a gold standard for the detection of energy expenditure, shows an important discrepancy in the results of dietary inquiries, which generally underestimate energy intake, mainly because of individuals' underreporting[21]. This error may also be partially triggered by food composition tables, which are limited.

Regarding the prevalence of inadequate intake of vitamin C in the present study, the data were similar to the results of other studies[22,23] that observed an inadequate

intake of vitamin C in only 0.8% of pregnant women. On the other hand, the inadequate intake of vitamin E was much higher and was similar to the finding of a study conducted with Spanish pregnant women which revealed an inadequacy of 67.8%[23]. The low inadequacy of vitamin C intake may be explained by the fact that Brazil is a tropical country where there is a great variety of citrus fruits, which are the main source of vitamin. This could be confirmed by a qualitative analysis of the diet, which revealed a regular consumption of fruits rich in this vitamin and easily found in the region, like the Barbados cherry, cashew, orange, guava and lemon.

The high rate of inadequate intake of folic acid in pregnant women is worrisome because low concentrations of maternal folic acid can result in megaloblastic anemia, preterm birth, low birth weight and neural tube defects[24]. A study conducted with Spanish pregnant women in the third trimester of pregnancy showed a prevalence of inadequate intake of folic acid of 99.6%; however, when dietary supplementation was assessed, the inadequate intake significantly reduced to 40.8%[23].

It is important to remember that the high rate of inadequate intake of folic acid may be underestimated since Brazil has a legislation tailored to the fortification of flour and, therefore, bakery products fortified with iron and folic acid that may not be in the foreign table used in the Nutwin software used to quantify nutrient intake.

With regard to dietary iron intake, it was observed that less than 2% of pregnant women presented an adequate intake. The low iron intake is directly associated with iron-deficiency anemia, In developing countries, micronutrient deficiency during pregnancy is common and circa 50% of pregnant women are anemic. Severely anemic women are at increased risk for death during pregnancy. Thirteen per cent of maternal deaths in Asia and 4% in Africa are directly caused by anemia as it contributes to more than 30% of deaths due to hemorrhage[25].

In Brazil, studies on the prevalence of anemia in pregnant women are restricted to specific populations and do not allow the generalization of the findings[26]. However, it is important to consider that the estimation of the prevalence of inadequate iron intake in the present study considered only dietary data from food sources and not dietary supplementation medication.

The inadequate intake of calcium in pregnant women was very high. It is important to inform that the estimation did not consider calcium supplement; however, it was observed an average intake of calcium of 416 mg/day, and this low intake may be associated with the low income of pregnant women. Low-income populations do not have access to calcium-rich foods, contributing to an inadequate intake[27]. Calcium deficiency in pregnant women is associated with gestational hypertension, a disease that if left untreated may lead to preterm birth, compromising mother and baby's wellbeing. Furthermore, there may be an increase in the mobilization of maternal skeleton calcium store and occurrence of postmenopausal osteoporosis[28].

The high rate of inadequate intake of vitamin A in pregnant women shows the big deficiency in the food choices of this group. A study assessing dietary intake of pregnant women residing in urban and rural areas of China revealed an inadequate intake of vitamin A of 94.3% for pregnant women residing in urban areas and 65.2% for pregnant women residing in rural areas[29]. The divergent result derives from methodological differences when assessing the adequacy in dietary intake as our study used the EAR and the aforementioned study used AI.

The dietary assessment, despite the limitations of the method and instruments available, stand out as an indicator of nutritional risk and when used in combination with other more sensitive indicators it can contribute to the diagnosis and treatment of specific nutritional deficiencies[30-32]. The search or enhancement of dietary assessment methods capable of classifying populations and individuals according to categories of one or more nutrient deficiency risks have certainly contributed to improve the relationship between dietary indicator and other indicators of nutritional state[30-32].

One of the limitations of the present study was the impossibility to assess the adequacy of protein and lipid as it was not possible to establish minimum and maximum values of distribution of these macronutrients from the values of the Estimated Energy Requirement (EER) and Acceptable Macronutrient Distribution Range (AMDR). To calculate the EER for each trimester it would be necessary the application of 3 dietary recalls in the 3 stages of pregnancy (1st, 2nd and 3rd trimesters). This bias did not occur when assessing micronutrients because EAR values do not vary according to the trimester of pregnancy.

The present research revealed that pregnant women from Picos, Piauí, presented a prevalence of inadequate intakes of calcium, iron, folic acid and vitamin E of more than 98% and a prevalence of 38.9% of energy intake above what is recommended. These results may be influenced by the low income per capita and show the need to develop strategies focusing on the importance of an adequate nutrition and therefore improving pregnancy outcomes.

The group assessed here presented a high prevalence of excess energy intake according to the nutritional state during pregnancy. These data are important and reveal the importance of the nutritional control and follow-up of pregnant women since obesity epidemic is a worldwide

relevant problem that has a great impact on maternal and fetal health. Excess weight during pre-gestational and gestational periods causes pregnancy complications (such as gestational diabetes, hypertension and preeclampsia), affects fetal growth, causes congenital anomalies and increases the risk of perinatal mortality. Today, it is known that the impact of maternal obesity goes beyond intrauterine and neonatal life as it affects childhood, adolescence and adult life[33].

Therefore, it is important to develop strategies of nutritional support in order to improve the intake of these micronutrients since the conception and reinforce actions for the regulation of propagandas and products targeted to these groups.

CONCLUSION

There was a high prevalence of inadequate intake of micronutrients (calcium, iron, folic acid and vitamin E) in pregnant women as well as a high rate of inadequate energy intake revealed by the high prevalence of excess weight in pregnant women assisted in *Unidades Básicas de Saúde* (Basic Health Units). This emerges as a worrying situations since these results can trigger adverse consequences for the mother and child.

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