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ORIGINAL ARTICLE / *ARTIGO ORIGINAL*

Prevalence and factors associated with nutritional deviations in women in the pre-pregnancy phase in two municipalities of the State of Rio de Janeiro, Brazil

Prevalência e fatores associados aos desvios nutricionais em mulheres na fase pré-gestacional em dois municípios do Estado do Rio de Janeiro, Brasil

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ABSTRACT: ***Objective:*** To assess the prevalence and potential factors associated with pre-pregnancy nutritional status of women. ***Methods:*** This is a cross-sectional study carried out between December 2007 and November 2008 with 1,535 women in the first trimester of pregnancy and randomly selected in health units of the Brazilian public health system (SUS) in the municipalities of Queimados and Petrópolis in the State of Rio de Janeiro. The diagnosis of nutritional deviations was based on the Body Mass Index, according to the classification of the Institute of Medicine, and the following categories were obtained: underweight, normal weight, overweight and obesity. In the statistical analysis, the multinomial logistic regression model was used and an odds ratio and confidence interval of 95% were estimated. ***Results:*** The sample included women between 13 and 45 years. The prevalence of underweight, overweight and obesity were 10, 18 and 11%, respectively. Women living in Queimados, adolescents, women who did not live with a partner and smokers had a higher proportion of low pre-pregnancy weight. There was an association between hypertension, overweight and obesity. Adolescents presented lower chance to overweight and obesity. Living in Queimados reduced the odds of overweight. ***Conclusion:*** The proportion of pre-pregnancy nutritional deviations was high, and recognizing factors that lead to them is very important for an early identification of women at nutritional risk, with view to interventions to reduce the adverse effects of malnutrition on maternal and child health.

Keywords: Pregnant women. Nutritional status. Malnutrition. Overweight. Obesity. Epidemiologic factors.

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RESUMO: ***Objetivo:*** Verificar a prevalência e os potenciais fatores associados ao estado nutricional pré-gestacional de mulheres. ***Métodos:*** Estudo transversal, realizado entre dezembro de 2007 e novembro de 2008, com 1535 mulheres no primeiro trimestre de gestação, selecionadas aleatoriamente em unidades de saúde do Sistema Único de Saúde nos municípios de Queimados e Petrópolis, Estado do Rio de Janeiro. O diagnóstico dos desvios nutricionais foi procedido com base no Índice de Massa Corporal, segundo a classificação do *Institute of Medicine*, e as seguintes categorias foram obtidas: baixo peso, eutrofia, sobrepeso e obesidade. Na análise estatística, foi utilizado o modelo de regressão logística multinomial, sendo estimados a *odds ratio* e o intervalo de confiança de 95%. ***Resultados:*** Foram incluídas mulheres entre 13 e 45 anos. As prevalências de baixo peso, sobrepeso e obesidade foram, respectivamente, 10, 18 e 11%. Mulheres residentes em Queimados, adolescentes, aquelas que não viviam com companheiro e fumantes apresentaram maior proporção de baixo peso pré-gestacional. Foi observada associação entre hipertensão com o sobrepeso e obesidade. As adolescentes apresentaram menor chance para o sobrepeso e obesidade. Residir em Queimados reduziu a chance de sobrepeso. ***Conclusão:*** A proporção de desvio nutricional pré-gestacional foi elevada, sendo o reconhecimento de seus fatores fundamental para identificação precoce de mulheres sob risco nutricional, visando intervenções que minimizem os efeitos adversos da má-nutrição sobre a saúde maternoinfantil.

Palavras-chave: Gestantes. Estado nutricional. Desnutrição. Sobrepeso. Obesidade. Fatores epidemiológicos.

INTRODUCTION

The assessment of nutritional status in the pregestational period is very important to estimate the adequate weight gain during the pregnancy, to make possible nutritional monitoring in the period and to allow early diagnosis of risk for unfavorable outcomes, as well as to guide nutritional intervention to promote maternal and childhood health[1].

Overweight and obesity in the pregestational periods increase chances for excessive weight gain during the pregnancy and are associated with countless negative consequences for the fetus (hemorrhage, macrosomia, suffocation) and the woman (gestational diabetes mellitus, arterial hypertension, pre-eclampsia, eclampsia, and weight retention after delivery)[2,3].

On the other hand, low pregestational weight increases the risk of weight gain below the recommendations, which may cause intrauterine growth restriction, premature labor, low birth weight and rise in perinatal morbimortality rates[3,4].

A wide range of factors associated with overweight and obesity in the pregestational phase is well-known: mother's age > 35 years[5], arterial hypertension, diabetes mellitus, alcohol consumption[1,6], low educational level, black skin, excessive energy intake and sedentary lifestyle[7].

In adolescence, some morbidities, smoking and the use of other drugs during pregnancy are factors associated with low pregestational weight[8,9]. It is important to note that poverty is related to different types of nutritional deviations (low weight, overweight, obesity)[5,9].

The State of Rio de Janeiro is strongly marked by economic inequalities from city to city, considering human development indicators[10]. The main hypothesis of this paper is that the prevalence of pregestational nutritional deviations may be different according to the level of development in the city or municipality, and factors such as food insecurity and mood disorders are possibly related to nutritional deviations.

The purpose of this study was to verify the prevalence of pregestational nutritional deviation (low weight, overweight and obesity) and the main factor causing it in the pregnant assisted by the Brazilian public health system (SUS) in the cities of Queimados and Petrópolis, Rio de Janeiro, Brazil.

METHODS

This is a cross-sectional study, with data collected in the first phase of follow-up in a prospective study aimed at observations in four stages (pregnancy, post-labor period, at three and six months post-labor).

A total of 1750 pregnant women were randomly invited to participate in the original study, all of them living in Queimados and Petrópolis (RJ) and assisted in prenatal services of 11 health units of the Brazilian Public Health System (SUS) (eight in Queimados and three in Petrópolis). Because of some refusals (n = 70) and the exclusion of 145 women by lack of information about pregestational weight or height, the sample held 1535 pregnant women.

The primary healthcare centers selected were identified in the national database of healthcare institutes (CNES)[11] and covered 90% of the prenatal care in both cities. The other 10% were not included in the study because of the difficulty in logistics to follow sporadic appointments in many centers enrolled in the Family Health program.

Data collection was made by interviews, anthropometric assessment and verification of prenatal care records in the first three months of gestation. For the interview, a questionnaire was elaborated specifically for this study, being previously tested in a pilot-study. Basic data were collected between December 2007 and November 2008 after all participants signed the informed consent form. All questionnaires were reviewed, codified and typed twice.

The anthropometric assessment comprised height (in centimeters), measured at the healthcare centers using a 2-meter aluminum stadiometer, with 0.5 cm sensibility coupled in a mechanical Filizola® branded scale. In 20% of the cases, the height was noted based on the participants' referral due to lack of equipment in the healthcare centers. Pregestational weight was reported by the participants in the beginning of the study. In lacking this information, it would be collected from

their medical records after being assisted up to the 14th week of gestation (2% of the cases). According to the World Health Organization (WHO)[12], women in the first three months of gestation do not gain weight, and they can even lose 0.2 kg on average; therefore, the weight reported in this period has been considered a proxy of the pregestational weight.

To determine the pregestational nutritional status, in compliance with the Institute of Medicine (IOM)[9], the categories of Body Mass Index (BMI) were adopted, based on the reference values by the WHO[9]: underweight (< 18.5 kg/m²); eutrophic (18.5 to 24.9 kg/m²); overweight (25 to 29.9 kg/m²), and obese (≥ 30 kg/m²).

The external variables assessed were:

1. social and demographic: age in years (≤ 19; 20-34; ≥ 35), marital status (living or not with a partner), skin color according to their own classification (white, black/brown), educational level in years (≤ 4; 5-8; ≥ 9), work (having a job or not), economic strata (B/C, D/E);
2. lifestyle: smoking habit (yes or no), alcohol consumption (yes or no);
3. chronic diseases reported by interviewees: arterial hypertension (yes or no), diabetes mellitus (yes or no);
4. food insecurity: (food security; mild insecurity, moderate-severe insecurity);
5. mood disorders: trait anxiety (yes or no);
6. past obstetric history (primiparity – yes or no).

The city of residence (Petrópolis or Queimados) was also included as independent variable because of the social and economic differences between them: Queimados presents one of the worst HDI in the State (73th position among 91 cities of Rio de Janeiro, while Petrópolis holds the 7th position)[10]. Because of that, Petrópolis was set as reference for both bivariate and multivariate analyses.

For the economic classification we adopted the criteria by ABEP (Brazilian association for research institutes), which is based on the educational level of the head of the family, the presence of bathroom in the family's residence and other goods, being all applied in a final score to define the economic strata (with A as the highest and E the lowest)[13].

To measure the levels of Food Insecurity (FI – mild, moderate and severe) in the residence, the Brazilian scale for food security (EBIA) was used. This scale is composed of 15 central questions, being 7 about family members aging less than 20 years. All questions address the matter of food insecurity in all levels: mild FI (concerns about food shortage in the near future and rearrangements in order for the food last longer); moderate FI (restriction to food quantity), and severe FI (members suffering from hunger). In this paper, the moderate and the severe levels were assessed in conjunction, once there were very few families classified as severe FI[14].

To assess trait anxiety, we used the State-Trait Anxiety Inventory (IDATE), which comprises 40 items, 20 of them relating to trait anxiety and 20 relating to state anxiety, all of them

presenting 4 choices of answer (scoring 1 to 4). The items relating to trait anxiety scale were prioritized, once they are less susceptible to environmental changes and remain relatively stable over time. The cutoff point for anxiety was above 40, as used by Rondo et al.[15].

Statistical analysis was made using the Statistical Package for the Social Sciences (SPSS) for Windows 16.0. The χ^2 test was used to assess homogeneity in the descriptive analyses of independent and dependent variables. The prevalence of low weight, overweight and obesity was calculated according to each of the above-mentioned co-variable, using Odds Ratio (OR) with 95% confidence interval (95%CI).

To maintain the four categories of dependent variables (pregestational nutritional status), the multivariate analysis used was multinomial logistic regression, and BMI between 18.5 a 24.9 kg/m^2 (eutrophic) was the reference category. To compose the final model, all co-variables from the bivariate analysis were tested, in order not to exclude potentially important ones. Stepwise method was applied for adjustments, where all variables presenting $p > 0.05$ were excluded, and all variebles with $p \leq 0.05$ were considered significant and maintained in the model. The main study, *"Capital social e fatores psicossociais associados à prematuridade e ao baixo peso ao nascer"*, was approved by the Ethics Committee of ENSP/FIOCRUZ (CAAE: 0156.0.031.000-06).

RESULTS

Table 1 shows the higher prevalence of women aging 20 – 34 years (70.0%). As to educational level, 14.0% of the pregnant reported up to 4 years. Around 1/3 of the participants had some level of food insecurity. Based on pregestational BMI, 39.0% of women presented a type of nutritional deviation.

Table 2 brings an outline of the bivariate analysis for all independent analysis included in the model. We could observe a greater proportion of low pregestational weight in women living in Queimados, aging 19 years or less, not living with a partner, with smoking habits and presenting trait anxiety. Having a job and no previous labor were negatively associated with this outcome.

Having arterial hypertension and previous labors were associated with gestational overweight and obesity, while low educational level (up to 4 years of study) and mild food insecurity was related to obesity only. Then again, being a teenager and not living with the partner were not related to obesity, and the prevalence of overweight was lower among women in the economic strata D/E and residents of Queimados.

In the multivariate analysis (Table 2), the variables that could explain low pregestational weight, even controlled by the others, were: being resident in Queimados, being a teenager, having smoked during pregnancy, and not living with a partner.

The lowest prevalence of overweight was found among residents of Queimados, whilst the overall prevalence of overweight and obesity was inferior among teenagers. However, women presenting hypertension were at higher risk of overweight and obesity.

Table 1. Frequency of the potential factors associated with pre-gestational nutritional status of women treated at health units of the Brazilian health system in two municipalities of Rio de Janeiro, 2007 – 2008.

Variables	Total n	Low weight (n = 945) %	Eutrophic (n = 151) %	Overweight (n = 272) %	Obesity (n = 167) %	p-value
City						
Queimados	662	13.4	62.5	14.7	9.4	0.00
Petrópolis	873	7.1	60.8	20.0	12.0	
Age (years)						
≤ 19	338	16.6	67.5	10.4	5.6	
20 – 34	1064	8.5	59.8	19.6	12.1	0.00
≥ 35	133	3.8	60.9	21.1	14.3	
Marital status						
Living with partner	1134	8.1	61.2	18.5	12.2	0.00
Not living with partner	401	14.7	62.6	15.5	7.2	
Skin color						
White	526	8.9	63.1	15.8	12.2	
Black/brown	1009	10.3	60.8	18.7	10.2	0.27
Educational level						
≤ 4 years	211	10.4	53.1	20.9	15.6	
5 – 8 years	663	10.1	63.3	17.3	9.2	0.09
≥ 9 years	661	9.4	62.5	17.1	11.0	
Working at a job						
No	912	12.0	61.1	16.8	10.2	0.06
Yes	623	6.7	62.3	19.1	11.9	
Economic strata						
B/C	1044	9.5	60.4	19.1	11.0	0.21
D/E	491	10.6	64.0	14.9	10.6	
Smoking						
No	1230	8.8	61.4	18.4	11.5	0.01
Yes	305	14.1	62.3	15.1	8.5	

Table 1. Continuation.

Variables	Total n	Low weight (n = 945) %	Eutrophic (n = 151) %	Overweight (n = 272) %	Obesity (n = 167) %	p-value
Alcohol						
No	1409	9.7	61.7	17.8	10.8	0.92
Yes	126	11.1	60.3	16.7	11.9	
Diabetes Mellitus						
No	1508	9.7	61.7	17.6	10.9	0.38
Yes	15	20.0	46.7	26.7	6.7	
Arterial hypertension[#]						
No	1416	10.2	63.3	16.8	9.6	0.000
Yes	110	5.5	37.3	30.0	27.3	
Food insecurity[#]						
Food security	955	9.1	63.8	17.6	9.5	
Mild insecurity	352	10.8	58.5	17.6	13.1	0.25
Moderate/severe insecurity	228	11.4	57.0	18.4	13.2	
Trait anxiety						
No	427	7.3	64.6	16.9	11.2	
Yes	1108	10.8	60.4	18.1	10.7	0.15
Primiparity						
No	626	13.4	64.5	14.2	7.8	0.00
Yes	839	7.3	58.3	20.9	13.6	

[#]Women without information for this variable were excluded.

DISCUSSION

In the last decades, nutritional transition has been characterized by a drop in malnutrition concomitantly with a rise in overweight and obesity rates all over the world, with special emphasis to western and developing countries[4,16]. In Brazil, according to data from the last Family Budget Survey (POF)[17], performed in 2008/09, low weight among women had a drop from 10.2 to 3.6%, while overweight and obesity presented rise from 8.0 to 18.4%

Table 2. Bivariate and multivariate analysis of potential factors associated with pre-gestational nutritional status of treated at health units of the Brazilian health system in two municipalities of Rio de Janeiro, 2007 – 2008.

Variables	Bivariate analysis			Multivariate analysis		
	Low weight	Overweight	Obesity	Low weight	Overweight	Obesity
	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)
City						
Queimados	1.86 (1.30 – 2.66)**	0.73 (0.55 – 0.97)**	0.74 (0.52 – 1.05)	1.98 (1.37 – 2.86)**	0.72 (0.54 – 0.96)**	0.74 (0.52 – 1.05)
Petrópolis	1	1	1	1	1	1
Age (years)						
≤ 19	1.77 (1.22 – 2.59)**	0.45 (0.30 – 0.68)**	0.42 (0.25 – 0.70)**	1.56 (1.05 – 2.31)**	0.48 (0.31 – 0.73)**	0.46 (0.27 – 0.80)**
20 – 34	1	1	1	1	1	1
≥ 35	0.45 (0.18 – 1.14)	0.95 (0.59 – 1.54)	1.19 (0.69 – 2.03)	0.52 (0.20 – 1.35)	0.87 (0.53 – 1.41)	1.05 (0.60 – 1.82)
Marital status						
Living with partner	1	1	1	1	1	1
Not living with partner	1.80 (1.25 – 2.59)**	0.76 (0.55 – 1.06)	0.60 (0.39 – 0.92)**	1.59 (1.08 – 2.34)**	0.87 (0.61 – 1.23)	0.74 (0.47 – 1.17)
Skin color						
White	1	1	1			
Black/brown	1.18 (0.81 – 1.72)	1.22 (0.90 – 1.64)	0.84 (0.59 – 1.19)	–	–	–
Educational level						
≤ 4 years	1.25 (0.73 – 2.15)	1.39 (0.92 – 2.10)	1.64 (1.03 – 2.61)*	–	–	–
5 – 8 years	1.03 (0.71 – 1.51)	0.96 (0.71 – 1.30)	0.78 (0.54 – 1.13)			
≥ 9 years	1	1	1	–	–	–
Working at a job						
No	1	1	1			
Yes	0.56 (0.38 – 0.82)**	1.11 (0.84 – 1.47)	1.15 (0.82 – 1.62)	–	–	–
Economic strata						
B/C	1	1	1			
D/E	0.97 (0.67 – 1.41)	0.71 (0.52 – 0.97)**	0.86 (0.60 – 1.24)	–	–	–

Table 2. Continuation.

Variables	Bivariate analysis			Multivariate analysis		
	Low weight	Overweight	Obesity	Low weight	Overweight	Obesity
	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)
Smoking						
No	1	1	1	1	1	1
Yes	1.62 (1.09 – 2.41)**	0.84 (0.58 – 1.20)	0.68 (0.43 – 1.09)	1.71 (1.13 – 2.57)**	0.80 (0.56 – 1.16)	0.61 (0.38 – 1.00)
Alcohol						
No	1	1	1			
Yes	1.21 (0.66 – 2.22)	0.98 (0.59 – 1.63)	1.07 (0.58 – 1.94)	–	–	–
Diabetes Mellitus						
No	1	1	1			
Yes	3.09 (0.76 – 12.53)	2.27 (0.63 – 8.12)	0.91 (0.10 – 7.61)	–	–	–
Arterial hypertension*						
No	1	1	1	1	1	1
Yes	0.58 (0.20 – 1.65)	2.87 (1.76 – 4.66)**	4.30 (2.57 – 7.20)**	0.60 (0.20 – 1.72)	2.84 (1.73 – 4.64)**	4.23 (2.51 – 7.15)**
Food insecurity*						
Food security	1	1	1			
Mild insecurity	1.29 (0.85 – 1.95)	1.09 (0.78 – 1.52)	1.49 (1.01 – 2.20)**			
Moderate/ severe insecurity	1.40 (0.86 – 2.25)	1.17 (0.79 – 1.72)	1.54 (0.98 – 2.43)			
Trait anxiety						
No	1	1	1			
Yes	1.72 (1.11 – 2.67)**	1.19 (0.87 – 1.62)	0.98 (0.68 – 1.42)	–	–	–
Previous childbirth						
No	1	1	1			
Yes	0.60 (0.42 – 0.85)**	1.62 (1.21 – 2.16)**	1.92 (1.34 – 2.75)**	–	–	–

*p < 0.20; **p < 0.05; OR: Odds Ratio.

and from 28.7 to 48%, respectively. A study conducted by Rodrigues et al.[18] with pregnant women living in Rio de Janeiro had similar results, with prevalence of 5.5% low weight and 33.4% overweight in the pregestational period.

In this paper, we noticed a prevalence of 40% of pregestational nutritional disorders, with emphasis to overweight (18%) and obesity (11%), but also a high rate of malntrition (10%). These results are similar to those found by Andreto et al.[8] and Seabra et al.[19]. The former[8], conducted with low-risk women from a Healthcare for women (SUS) in Redife found 11.0% of women presenting low weight and 26.5% overweight/obesity in the pregestational period. The latter[19], carried out at a maternity from SUS in Rio de Janeiro, showed 24.5% of pregestational overweight/obesity

A possible explanation for these divergences in results between studies is the means of measuring pregestational weight, for there is a tendency to weight underestimation when women make self-reference[20]. However, one must consider that part of the sample was resident in Queimados, the city presenting the worst social indicators in Rio de Janeiro, which may have contributed with these results[10].

Living in Queimados was a factor related to low gestational weight gain, which shows greater vulnerability of the women living in low development places to this nutritional disorder, even though our sample was composed exclusively of women assisted by SUS.

From all risk factor described in literature, maternal age and smoking were shown to be related to low pregestational weight. The higher probability of low weight among teenagers results from the several physical, behavioral, psychological and hormonal changes that usually occur in this period, including the tireless quest for slimness[21]. Smoking is considered an independent risk factor for low BMI in adults because it impacts on the appetite and causes the expenditure of money with cigarettes to the detriment of food[22].

However, some other risk factors were associated with low weight and can cause or worsen malnutrition, thus increasing the risks for the mother and the child[23]. Not living with a partner was considered a factor related to low pregestational weight. According to Moraes e Reichenheim[24] and Leal et al.[25], having a partner may work as protection against other factors such as alcohol intake during pregnancy and prenatal care adherence. Very few studies have addressed the matter of nutritional status, though.

The study by Velásquez-Meléndez et al.[26], conducted with a sample of 1,105 subjects living in the Metropolitan Area of Belo Horizonte (BH), did not assess the prevalence of low weight, but found a potential risk (60% higher) for overweight in married women as compared to the others. It is possible that women with partners be at higher risk for overweight/obesity because they are supported by their family and friends during this period[8], unlikely women without partners, who may have less social support.

In the bivariate analysis, the presence of trait anxiety increased the chance of low pregestational weight. Although this association lost statistical significance in the

multivariate analysis, one should note the clinical relevance of the assessment of anxiety in this period, because this is a disorder known to mediate endocrinal changes and certain risky behaviors that predispose to low weight, such as smoking and inadequate food intake[27].

As to other nutritional disorders, we highlight a strong association with hypertension, overweight and obesity, which is well-know and have been repeatedly reported in literature[28].

Some factors considered to be risky for overweight and obesity, according to literature, such as maternal age[5], educational level[10,26], parity[29] and alcohol consumption[30] were not shown to be related to these disorders in our study, probably because of the small sample size.

In studies where the economic situation was measured by the family income, the lowest economic conditions was associated with malnutrition and overweight/obesity[2,6]. Our study showed that women from lower economic strata (D/E) were considered protected from obesity in the bivariate analysis only. This association is probably due to the less food supply and lack of information[25]. According to POF[17], the highest rates of overweight and obesity were seen in intermediate economic strata.

The interpretation of association between FI and nutritional disorders is more complex. We did not find any association between these two variables in the bivariate or the multivariate analysis. However, in FI, changes in eating habits may be related to reduction in the amount of food available and to loss to nutritional quality, once the family may be on a diet rich in fat and carbohydrates, for this type of products increase satiety and present lower costs when compared to fruits and vegetables. Although these are protective factors against obesity, they end up increasing family budget[7,31]. Families with FI are usually exposed to few opportunities of regular physical activities, because they often live in areas presenting high rates of crimes and with difficult access to recreation[32]; they also live in a context of food privation and possible eating compensation, which cause metabolic changes[33], and live in familial contexts more prone to violence, restricted access to food and to healthcare services[34]. These factors increase the levels of stress and may consequently cause weight gain due to countless hormonal changes[34].

The expressive amount of women presenting weight deviation in the pregestational phase reinforces the need for nutritional monitoring before pregnancy, preferably during pre-conception assistance. According to recommendations by the Ministry of Health (MH)[35], this phase is aimed at identifying risk factors or diseases that may be impact on the normal development of a future pregnancy, and it constitutes an important tool for the reduction of maternal and childhood morbidity and mortality. However, spontaneous search for this activity is still infrequent among women[35], and that is why women's appointments in healthcare centers must be seen as opportunities to anthropometric measures of weight and height. If any change in nutritional status is diagnosed, an adequate monitoring of the patient must be assured.

We emphasize the high rate of pregnant women with low pregestational weight, which reinforces the importance of a nutritional monitoring to identify women at risk in a moment where overweight and obesity are much more common. Although less frequent, malnutrition still affects a portion of the population, especially people living in cities and municipalities in bad socio-economic conditions such as Queimados, and it demands healthcare services to promote actions toward these women and their children's well-being.

Some known factors associated with nutritional disorders are recognized[3,5]. However, new ones were observed based on validated scales such as economic classification, food insecurity and trait anxiety. Although the associations found were not maintained in the multivariate analysis, new grounds for research and political actions on this subject were broken.

The high prevalence of women at food insecurity (almost one third of the sample), shows the need for public policies that can increase the production and availability of food that is nutritionally adequate and safe at low costs, and the need for an effective practice by health professionals aimed at identifying women at vulnerable state earlier and at developing educational actions to ensure the best use for the available food.

The results of this study are expected to contribute with the improvement in knowledge about factors associated with pregestational nutritional disorders. They are key-points to clinical management, for they allow identifying and monitoring risk factors, as well as the formulation of public policies aiming at reducing the prevalence of women at nutritional risk and assuring good obstetric outcomes that can reflect in the mother and the child's health at short and long term.

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