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Excess of Weight and Consumption of Industrialized Foodstuffs Induces the Occurrence of Hypertensive Diseases during Gestation

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Abstract

Objectives: The aim of this study was to evaluate whether the dietary intake and nutritional status of pregnant women, were associated with the prevalence of hypertensive diseases during pregnancy (HDP).

Methods: It was a cross-sectional study developed in Brazil, which evaluated 125 pregnant women, of whom 16.8% (21) presented HDP. Socioeconomic data, gestation, anthropometry, health status and food consumption were analyzed through a 24 hour dietary recall (24 HR) and a food frequency questionnaire (FFQ). Statistical tests were used at the significance level set at 5%.

Results: Among the pregnant women, 10.4% (n = 13) used antihypertensive medication, 16.0% (n = 20) had preexisting comorbidity and 80.8% (n = 101) had a family history of hypertension arterial (HA). The factors associated with the prevalence of HDP in this population were pre-gestational body mass index (BMI) (p = 0.017), current BMI (p = 0.009), arm circumference (p = 0.002), family history of HA = 0.035), associated comorbidities (p = 0.009) and consumption of industrialized foods (p = 0.007).

Conclusions: Our results show that the prevalence of HDP among pregnant women was associated with nutritional factors such as body weight and dietary intake. Thus, nutritional care during pregnancy can act as a protective factor for the health of this population, minimizing maternal and fetal complications.

Keywords: *Hypertensive Diseases during Pregnancy; High Risk Pregnancy; Food Consumption; Nutritional Status*

Introduction

It is known that about 830 women die daily in the world due to preventable causes related to gestation, and hypertensive diseases during gestation (HDP) are one of the most common and relevant complications that feed this statistic, especially in developing countries like Brazil, where we observe that it is the second cause of maternal mortality, together with other chronic noncommunicable diseases (CNCD) [1].

The HDP can be classified into four different groups, according to the signs presented and the time at which hypertension (HA) is diagnosed, being: Chronic hypertension; Pre-eclampsia/Eclampsia, Preeclampsia superimposed on chronic hypertension and gestational hypertension [2].

Due to the etiology of its nature, severity, its complications and the means used to control it, this pathology becomes expensive not only for the patient and family, but as well as for the health system. According to the 2015 Heart Disease and Stroke Statistics study, this comorbidity was already responsible for 10% of the total cost of global health, with estimated expenditures of $ 370 billion per year [3].

Several factors contribute to HDP, such as age at the extremes of the reproductive stage, presence of diabetes, nephropathy, and family history of CNCD, or because of modifiable factors, such as unhealthy eating habits, excess body weight before the gestational phase or excessive weight gain during the gestational period, sedentary lifestyle, alcoholism and smoking [4,5].

Some specific dietary components increase the likelihood of HDP development, such as low levels of vitamins, minerals, fibers and antioxidants, and high consumption of ultraprocessed foods. These characteristics are present in most of the dietary patterns seen today as a consequence of the rhythm and lifestyle of the globalized world [6].

And as a consequence of this dietary pattern, there is development of greater accumulation of weight, overweight or obesity. Factors already demonstrated to be relevant to the development of CNCD, including HDP. It is recommended that women who plan to be pregnant should maintain their body weight within normal limits [7].

In this context, the objective of this study was to evaluate whether food intake and the nutritional status of pregnant women were correlated with the prevalence of HDP.

Methods

This is a cross-sectional study carried out with adult pregnant women attending an outpatient clinic connected to a university hospital in Belo Horizonte, Minas Gerais, between February 2014 and July 2015. Those women who had twin pregnancies, or infectious diseases were excluded from the study.

Participation began after the invitation and signing of the Informed Consent Term (TCLE) according to the institution's Ethics Guide, the information was obtained through a structured questionnaire, built for the research. The pregnant women were questioned, by well-trained interviewer, regarding Socioeconomic, gestational and health status data. In addition, an anthropometric evaluation, a Food Frequency Questionnaire (FFQ) and a 24 hour dietary recall (R24h) were performed.

The socioeconomic data collected were: age, marital status, parity, professional occupation and schooling. Regarding gestation and health status, we questioned: gestational age, intercurrences during the current gestation and family history of HA.

For anthropometric evaluation, current weight and height were measured according to the methods proposed by the World Health Organization (WHO) [8]. The pre-gestational weight and the weight gain until the day of the evaluation were informed by the participants at the time of the interview. The Body Mass Index (BMI) was calculated using the standard formula (weight in kg/height^2), considering the weight and height ratio.

The data obtained on the basis of pre-gestational weight were then classified according to WHO [8] and those based on the current weight according to Atalah., *et al*. [9], a method recommended by the Brazilian Ministry of Health [10].

In addition, arm circumference (AC) was also measured as a complementary method for the classification of their nutritional status, being carried through protocol proposed by Frisancho [11].

For the evaluation of the food consumption of the pregnant woman, the FFQ was composed of 16 food items [12]. The frequency of food consumption options was adapted to better meet the objective of this study, being: daily, weekly, monthly, rarely or never.

In addition, R24h was applied, where the individual reports all foods (solids and liquids) consumed during the 24 hours prior to the interview, using home measurements to help quantify the ingested portion, which allows a quantitative analysis through the method. It also does not promote a change in the usual diet, since the report is after eating and, as the interview period and intake are short, individuals remember most of the foods they consume (reducing memory bias). Subsequently, the data obtained by R24h were associated with the respective nutritional composition information (energy, carbohydrate, protein, lipid and fiber) [13]. The data collected through R24h were evaluated regarding energy and nutrient composition through DietWin software 2014.6.30.13554.

Statistical analysis was performed using statistical software (SPSS), version 19. Initially, the Kolmogorov-Smirnov test was performed to evaluate the adhesion of the variables to the normal distribution. Then the descriptive analysis by calculating frequencies and measures of central tendency and dispersion. Finally, univariate analyzes were performed in which the chi-square tests were used to estimate the association between two qualitative variables, Student's t Simple and Mann Whitney, for comparison of means and medians, respectively. Results were presented as a median and 95% confidence interval. For all analyzes, a significance level of 5% was adopted.

Results

A total of 125 pregnant women were evaluated, with a mean age of 31 (95% CI 29.7 - 31.9), most married (70.2%: n = 87) and paid work (64.8% : n = 79). The highest prevalence of schooling was high school (53.3%: n = 65). The pregnant women presented median gestational age equal to 25 (95% CI 6 - 39) weeks and 55.2% (n = 69) already had children.

Of the total population, 38.4% (n = 48) presented problems in the current gestation, being those that presented HDP 16.8% (n = 21). Among the pregnant women, 10.4% (n = 13) used antihypertensive medication, 24.8% (n = 31) performed folic acid supplementation, 16.0% (n = 20) had pre-existing comorbidity and 80.8% (n = 101) reported a family history of HA.

Through the analysis of the anthropometric measures, a significant prevalence of previous obesity and at the time of evaluation was identified, as shown in figure 1. The median weight gain until nutritional care was 6.65 kg (95% CI 6.8 - 43.3), the BMI was 32.5 kg/m^2 (95% CI 15.2 - 54.0) and the AC was 31.0 centimeters (95% CI 30.3 - 33.3). The median pre-gestational BMI was 28.1 kg/m^2 (95% CI, 17.2 - 52.9).

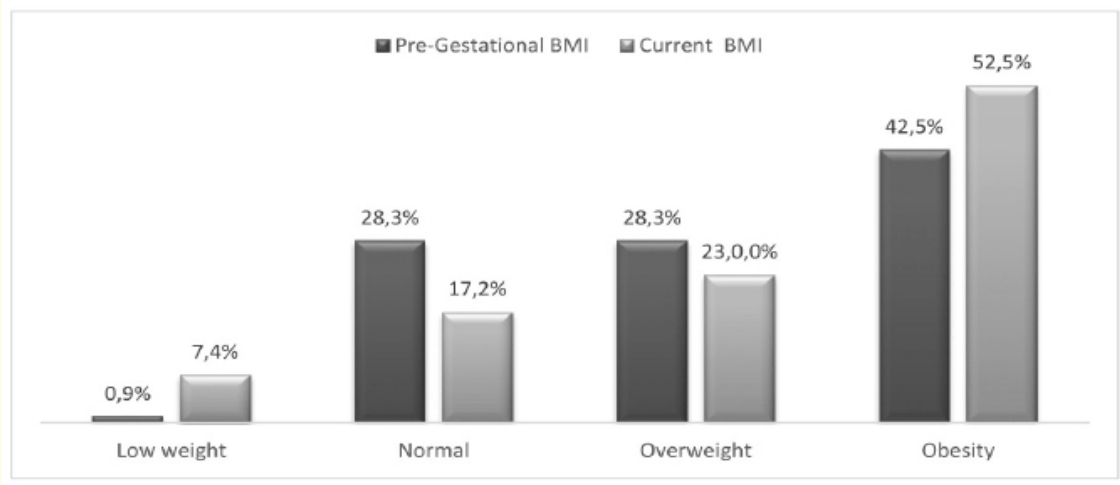

Figure 1: *Nutritional status based on Pre-Gestational and Current BMI. The classification of nutritional status based on pre-gestational and current BMI of high-risk pregnant women attending an outpatient clinic connected to a university hospital in Belo Horizonte, MG, Brazil, 2014-2015.*

In relation to food consumption (Table 1), the high daily intake of added sugar (41.6 g/day/person) and cooking oil (20.0ml /day/person) was high. In addition, the sodium intake found was 4506.8 mg/day /person, which is higher than that recommended by the Institute of Medicine (IOM) based on the Dietary Reference Intakes (DRI's), which is determined by Adequate Intake (AI) that sodium intake should not exceed 1500mg/day for pregnant women in any age group [14].

Variable	Median	IC95%	Recommendation
Calories (kcal)	1571,09	495,93 - 3489,99	1200,0 - 2500,0
Proteins (%)	16	5 - 28,9	10 - 35
Carbohydrate (%)	53,7	51,9 - 54,7	55 - 65
Lipid (%)	30,0	16,0 - 51,0	20 - 35
Fibers (g)	21,65	2,45 - 58,06	25 - 28
Sodium (mg)	4506,8	4112,6 - 4661,9	1500,0 - 2300,0
Per capta salt (g/dia)	5,5	5,3 - 7,3	2,5 - 5,0
Per capta oil (ml/dia)	20,0	22,6 - 30,2	16,0
Per capta sugar (g/dia)	41,6	37,7 - 51,8	25,0 - 50,0
Water Intake (l/dia)	1,5	1,5 - 1,9	1,5 - 3,0

Table 1: *Food intake based on R24h.*
Food consumption according to R24h of high-risk pregnant women attended at an outpatient clinic connected to a university hospital in Belo Horizonte/MG, Brazil, 2014-2015.

Table 2 shows the results of food consumption evaluated by the FFQ, which pointed out relevant weekly consumption of industrialized foods, such as, sausages (50.4%: n = 62), biscuits (33.3%: n = 41), fried food (49.2%: n = 60), industrialized sauces (27.9%: n = 24) and fried snacks (26.3%: n = 32).

Food	Daily % (n)	Weekly % (n)	Monthly % (n)	Rare/Never % (n)
Fruits	69,1 (85)	26,8 (33)	1,6 (2)	2,4 (3)
Leaf vegetables	61,0 (75)	30,1 (37)	1,6 (2)	7,3 (9)
Non leaf vegetables	61,8 (76)	27,6 (34)	4,9 (6)	5,7 (7)
Milk	60,2 (74)	18,7 (23)	6,5 (8)	14,6 (18)
Milk Derivatives	37,7 (46)	36,9 (45)	9,8 (12)	15,6 (19)
Meat	79,7 (98)	17,1 (21)	0,0 (0)	3,3 (4)
Fish	0,0 (0)	28,5 (35)	24,4 (30)	47,2 (58)
Sausages	4,9 (6)	50,4 (62)	19,5 (24)	25,2 (31)
Biscuits	35,8 (44)	33,3 (41)	5,7 (7)	25,2 (31)
Cookies	3,5 (3)	11,6 (10)	5,8 (5)	79,1 (68)
Ice Cream	1,2 (1)	26,7 (23)	24,4 (21)	47,7 (41)
Fried food	18,9 (23)	49,2 (60)	12,3 (15)	19,7 (24)
Fried snacks	5,7 (7)	26,3 (32)	27,0 (33)	41,0 (50)
Chips	1,2 (1)	5,8 (5)	7,0(6)	86,0 (72)
Sandwiches	0,0 (0)	17,4 (15)	40,7 (35)	41,9 (36)
Artificial sauces	2,3 (2)	27,9 (24)	23,3 (20)	46,5 (40)
Lard	4,7 (4)	0,0 (0)	1,2 (1)	94,2 (81)
Alcoholic beverage	0,0 (0)	1,2 (1)	4,7 (4)	94,8 (81)

Table 2: *Food intake based on FFA.*
Food intake according to the FFA of high-risk pregnant women attending an outpatient clinic connected to a university hospital in Belo Horizonte/MG, Brazil, 2014-2015.

According univariate analyzes (Table 3), AC, pre-gestational BMI and current BMI, presence of gestational intercurrence, family history of hypertension, and high sodium intake were associated with the prevalence of HDP. However, these variables did not fit the multivariate model.

Variable	Median or Percentage	P value
Arm circumference		0,002
Presence of SAH	37,0 (IC95% 34,4 - 38,6)	
Absence of SAH	30,2 (IC95% 26,6 - 32,1)	
Classification of Pre-Gestational BMI		0,017
Normal	20,0	
Overweight	15,0	
Obesity	65,0	
Classification of Current BMI		0,009
Normal	14,3	
Overweight	9,5	
Obesity	76,2	
Associated comorbidities*		0,009
Yes	71,4	
No	28,6	
Family History of SAH		0,035
Yes	100,0	
No	0,0	
Consumption of sausages		0,007
Daily	20,0	
Weekly	55,0	
Monthly	10,0	
Rare or Never	15,0	

Table 3: Variables related with Systemic Arterial Hypertension (SAH).

*Variables that presented p value ≤ 0.05 in the univariate analysis of association with Systemic Arterial Hypertension (SAH). *Associated comorbidities: Diabetes Melitus, Gastrointestinal, Thyroid, Renal Problems and ≤ 2%: Neoplasms, Obstructive Sleep Apnea, Cardiopathies, Tuberculosis, Rheumatoid Fever, Sickle Cell Anemia, Lupus, Hepatitis, Epilepsy, and HIV.*

Discussion

In the present study, 16.8% of pregnant women presented HDP. Even pregnant women who are not overweight may develop HDP, however, gaining weight beyond what is recommended before and during pregnancy becomes a factor that can lead to the onset of HDP [7]. From the analyzes developed in this study it was possible to identify that HDP were associated not only with overweight but also with the family history of HA, presence of gestational intercurrence and consumption of foods with high sodium content.

HDP can have disastrous consequences for the gestation outcome, there is a greater probability of unfavorable evolution for the maternal-fetal binomial, with maternal complications such as thrombocytopenia, hemorrhage, stroke and blindness. And to the fetus about prematurity, intrauterine growth retardation, suffering and a high level of intolerance to labor [1,4,15].

The family history of HA significantly favors the presence of HDP, since the genetic factor is among the potential causes of its prevalence [16,17]. Thus, knowing the personal and family health history of the pregnant woman in the first prenatal consultations becomes extremely important and easy to reach, focusing on the identification, treatment and prevention of some of the associated complications, aiming at an adequate care and adoption of measures that prevent the worsening of the condition and complications of this condition [18].

Although it was a local study, which can be seen as a fragility, it presents a number of favorable participants allowing the interpretation not only of data that show the influence of nutritional status on the development of hypertension, but can also evaluate the participation of food consumption in this pathology and to reinforce the need for nutritional attention during pregnancy.

Obesity is not a simple problem to be solved. It has been reported that women during pregnancy have difficulties discussing their weight, and few proven therapeutic options to improve these results in this population specifically [19]. Thus, the incidence of obese pregnant women is increasing and overweight is a factor that is already associated with HDP [20-23].

Obesity is multifactorial, as well as HDP. However, the food choice favors the increase in weight, thus also favors the appearance of HDP. The results of our study showed that there is a high intake of foods rich in simple sugars and fats by the pregnant women interviewed. In addition, more than 20% of this population does not consume vegetables daily, these sources of antioxidant nutrients and vitamins, being low intake related to the increase of HDP [24] and increased intake of these preventive nutrients at their onset [25].

Therefore, nutritional attention and adequate guidance on food consumption could reduce gestational weight gain and consequently the occurrence of HDP [26] since there is a direct relationship between HDP and food consumption.

The present study evaluated the food consumption of the population. The most relevant finding to be discussed was sodium intake, which exceeds twice the maximum limit established by the IOM DRI in the Tolerable Upper Intake Level (UL), which corresponds to 2300 mg/day [14]. The high consumption of this mineral was due to the high consumption of processed foods, such as sausages. It has been previously described that the high consumption of foods rich in sodium associated with excess foods rich in simple sugars and fat also increase the chance of developing HDP [27].

In this way, the reduction of the consumption of industrialized foods should be considered a priority in changing the data of the current consumption of the population, generating important effect on the blood pressure and later CNCD, besides other beneficial health effects [28].

Another micronutrient that calls attention to diet versus HDP is folic acid, its adequate contribution is already described as relevant benefit endothelial function, associated with a lower incidence of cardiovascular diseases, including in the gestational phase [29,30]. Despite our findings this has not been pointed out as a factor associated with a prevalence of HDP, evidence in the literature demonstrates that efficient supplementation, as recommended during reproduction, is also necessary for the protective effect of HDP. Thus, it reinforces the importance of adequate nutritional monitoring for the specific needs of gestation.

The evaluation of dietary intake as well as the nutritional status of pregnant women at risk is thus directly related to gestational risks, and HDP is directly associated with overweight and consumption of foods rich in sodium, artificial condiments and saturated fat.

Adequate nutritional monitoring during gestation, especially those at high risk, makes it essential to minimize possible gestational complications and maternal and fetal morbi-mortality. Thus, nutritional risk factors for HA can be identified and treated in order to propose therapeutic or prophylactic interventions [31].

In this way, the present study shows the importance of the identification and early control of risk factors for the development of HDP, as well as an importance to the service demand of the nutrition team as a prophylactic and treatment form. Aiming at this, the study population positively reflected the gestational and postpartum outcome.

Conclusion

So, we conclude that, not only weight excess, but also historical family and high sodium intake is associated with occurrence of gestational hypertension.

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Conflicts of Interest

Authors declare that there is no conflict of interest.

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