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Food consumption patterns during pregnancy: a longitudinal study in a region of the North East of Brazil

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Abstract

Introduction: **the nutritional panorama in Brazil indicates that the dietary patterns of the population is characterized by the increasing inclusion of saturated and trans fats, sodium, sugars, soft drinks. This epidemiological and nutritional challenges reflects in the patterns of illness and death.**

Objective: **this study aims to identify patterns of food consumption and dietary changes in the first and third trimester of pregnancy.**

Methodology: **this is a prospective cohort study involving 185 pregnant women in the State of Bahia, from 2012 to 2013. We used a food frequency questionnaire to assess dietary intakes. To identify the dietary pattern, the principal components factor analysis was adopted. We used the Pearson correlation test to identify the correlation between the patterns extracted in each trimester.**

Results: **four patterns of food consumption during pregnancy were identified. We observed changes in the eating patterns over the trimesters evaluated, especially for the food groups of fruit, coffee, fats, fried snacks, sugar and sweets.**

Discussion: **these dietary changes throughout the pregnancy accompany the physiological changes of each period of the pregnancy. In the first trimester, symptoms of nausea and vomiting are common, whereas in the same period cravings is reported, which may justify the consumption of a larger quantity of food deemed unhealthy.**

Conclusion: **it was observed that there were changes in the adoption of dietary pattern throughout the evaluated trimesters of pregnancy, especially for the groups of fruit, coffee, fats, fried snacks and sugar and sweets.**

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Key words: *Dietary intake. Factorial Analysis. Pregnancy. Prenatal care.*

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PATRONES DE CONSUMO DE ALIMENTOS DURANTE EL EMBARAZO: UN ESTUDIO LONGITUDINAL

Resumen

Introducción: **las perspectivas de crecimiento en Brasil indican que los patrones dietéticos de la población se caracterizan por el aumento del consumo de grasas saturadas y trans, sodio, azúcares y refrescos. Este punto de vista epidemiológico y nutricional refleja el cambio en el patrón de la enfermedad y la muerte.**

Objetivo: **este estudio tiene como objetivo identificar los patrones de consumo de alimentos y los cambios en la dieta en el primer y tercer trimestres del embarazo.**

Metodología: **se trata de un estudio de cohorte prospectivo de 185 mujeres embarazadas del Estado de Bahía, a partir de 2012 a 2013. Se utilizó el cuestionario de frecuencia de alimentos para evaluar la ingesta alimentaria. Para identificar la norma alimentaria se adoptó el análisis factorial de componentes principales. Se utilizó la prueba de correlación de Pearson para identificar la correlación entre los patrones extraídos en cada trimestre.**

Resultados: **se identificaron cuatro patrones de consumo de alimentos durante el embarazo. Hemos observado cambios en los patrones de alimentación durante los trimestres evaluados, especialmente para los grupos de frutas, café, grasas, frituras, azúcar y dulces.**

Discusión: **estos cambios en la dieta durante el embarazo acompañan a los cambios fisiológicos de cada embarazo. En el primer trimestre son síntomas comunes las náuseas y los vómitos; por otro lado, también se manifiesta antojos en el mismo periodo, lo cual puede justificar el consumo de mayor cantidad de alimentos considerados saludables.**

Conclusión: **se observaron cambios en el patrón alimentario a lo largo de los diversos trimestres del embarazo examinados, especialmente para los grupos de frutas, café, grasas, frituras, azúcar y dulces.**

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Palabras clave: *Consumo de alimentos. Análisis Factorial. Embarazo. Atención Prenatal.*

Introduction

The nutritional panorama in Brazil indicates that the dietary patterns of the population is characterized by the increasing participation of saturated and trans fats, sodium, sugars, soft drinks and a significant decrease in fruits, vegetables, beans, roots and tubers[1]. This epidemiological and nutritional challenges reflects in the patterns of illness and death[2].

The epidemiological and nutritional transition creates a new scenario in Brazil, characterized by the decline in the occurrence of protein energy malnutrition among the adult and child population, and an increasing prevalence of chronic diseases, such as obesity, diabetes, hypertension and dyslipidemia. At the same time, specific micronutrient deficiencies, in particular vitamin A and iron, remain in an area of instability, particularly with a decline and/or increase in the prevalence of several deficiencies[3].

This nutritional scenario of the adult population is reflected in specific groups, such as in pregnant women. Results of specific epidemiological investigations reveal that the current dietary patterns of this group is characterized by an, insufficient amount of fiber, fruits and vegetables, and excessive saturated fat, trans and sugar[4,5], a similar dietary pattern when compared to the general population.

It is emphasized that this life cycle is accompanied by anatomical, physiological, psychological and emotional changes that interfere with all physiological functions of the pregnant woman[6], however, they are necessary for the proper development of the pregnancy. The expression of hormones in this period, especially in the first trimester, is responsible for signs and symptoms such as vomiting and nausea. The frequency of these signs and symptoms can interfere with the pregnant woman's diet, which may cause a loss of appetite and food deprivation, and consequently weight loss.

In addition, the energy and nutrient needs are high, while both excessive and insufficient consumption of foods can trigger health problems for the mother and child[7,8], as well as the pancreatic and hormonal development of the fetus[9]. This way, knowing the dietary patterns of women in different trimesters of pregnancy allows one to adjust food intake during pregnancy and prevent disorders associated with dietary intake for the mother and the child.

Information about the influence of maternal nutrition and maternal and child health conditions is insufficient in Brazil, and there are few studies that focus on the intricate relationship of maternal nutrition during pregnancy, as well as the dietary changes that occur in this period. In addition, we highlight the importance of studies with methodological designs which are sensitive to identify different patterns of dietary intake adhered to by women during pregnancy. Thus, this study aims to identify patterns of food consumption and dietary changes in the first and third trimester of pregnancy, among women in one municipality in the State of Bahia.

Methodology

This is a prospective, dynamic cohort study, conducted with 185 pregnant women, developed in the municipality of Santo Antônio de Jesus, Bahia, Brazil.

For the sample of this study, women over 19 years old, resident and domiciled in the urban area, in the catchment areas of the prenatal service of the Family Health Units, from April 2012 to June 2013, and that at the time of the approach were in the first trimester.

For the construction of the sample, the observed ratio for the number of variables was considered, being recommended a minimum of at least five times more observations than the number of variables to be analysed[10]. Thus, 15 times more observations than the number of variables (11variables * 15 observations) was adopted, calculating a sample of 165 pregnant women, with an additional 12% of acceptable loss, estimating the final sample at 185 pregnant women

During the capture period at the prenatal services at the Family Health Units (FHU), pregnant women answered questions about socioeconomic, demographic, reproductive and/or obstetric history and lifestyle. Weight and height measurements were taken during the interview by properly trained researchers.

To measure maternal weight, a portable digital scale was used, of the MARTE brand, capacity of 150kg and a sensitivity of 100g. Height was measured using the stadiometer, Welmy brand, with a capacity of 2000mm and a sensitivity of 0.5 cm. Anthropometric measurements were taken in duplicate. The accepted maximum variation was 0.5 cm for height, and 100g for weight.

We used the pre-pregnancy BMI (body mass index) (weight in kg/height^2) as proxies of pre-pregnancy anthropometric status of the pregnant woman. We classified the pre-pregnancy BMI based on the IOM parameters (2009)[11]. The anthropometric status during pregnancy was evaluated based on the BMI, classified according to the curve by Atallah et al.[12].

The subsequent stages of the investigation occurred in the first, second and third trimesters, at the residence of the pregnant women. Information was collected about the maternal dietary intake by the FFQ (food frequency questionnaire), recent test results performed in an accredited network of laboratories, and the weight was measured at every contact. Considering that information provided on dietary intake by the subject is unreliable, it was decided to delete this collection in the second trimester, to avoid rejection of the study and loss of monitoring.

To assess food consumption the FFQ was used, composing of 74 food items. This FFQ is adapted from the instrument used by Giacomello et al.[13] and was validated in a sample of 50 pregnant women and is in the process of being published.

To estimate the size of the portions of food being consumed, a photographic album of the portions of food and kitchen utensils[14] was used. Initially, the data from the food frequency in daily fraction of the

consumption was converted, resulting in only a unit of time.

Subsequently, the groups of foods were conceived. The consumption equal to or greater than 10% and the nutritional characteristics of the food group were considered as criterion of inclusion. Using this criterion, we excluded 5 foods (sweetener, skim milk, low-fat milk, yogurt and light beer) and built 11 food groups: (1) cereals/roots and tubers; (2) pulses; (3) fruit and natural juice; (4) vegetables; (5) milk and milk products; (6) meat and eggs; (7) industrialized products, meat products/cured meat (beef jerky and sun-dried meat); (8) sugar and sweets; (9) coffee; (10) fat; (11) fried snacks. To identify the dietary patterns of pregnant women during the follow-up period, we adopted the factor analysis (FA) with the extraction technique by principal components.

To verify the suitability and applicability of the factor model to the data set, we employed the statistical test of Kaiser-Meyer-Olkin (KMO) and Bartlett's sphericity test. The inclusion and maintenance of the food groups in the factorial model was evaluated by means of commonality. A commonality minimum of 0.30 was accepted. We applied the principal component analysis (PCA) for the extraction of factors (dietary patterns) and the varimax rotation, to allow better interpretability of the factors. The definition of the extracted factors (retained) was based on the Cattell graphic test or Scree plot and the Kaiser criterion, with factors with eigenvalues greater than 1 being adopted, which identified the maximum number of patterns to be extracted.

A factor loadings of ≥ 0.49 was adopted as a criterion for the selection of the food groups for inclusion in the pattern. The internal consistency of each factor was assessed using Cronbach's alpha. Finally, the patterns were named according to the characteristics of the food groups composing each pattern, and nomenclatures already used in scientific literature were used.

We used the Pearson correlation test between the factor scores of each dietary pattern to identify the correlation between the corresponding patterns extracted from each trimester evaluated. The perfect association was considered when the correlation coefficient (r) ranged from 0.9 to 1; strong association r= from 0.6 to 0.9; moderate association r= 0.3 to 0.6; weak association r= 0 to 0.3; tiny association r= 0.1 and null association r = 0[15].

For descriptive characterization of the study population, the variables were categorized by adopting cutoff points available in the literature. Excel software was used for the typing up of food consumption data, and the program *Statistical Package for Social Sciences*, version 17, was used for input data and factor analysis.

The Committee of Ethics in research of the School of Nutrition (CEPNUT) of the Federal University of Bahia, process 16/12, evaluated and approved the ethical relevance of the study. Pregnant women who agreed to participate freely signed the consent form.

Results

The socioeconomic, demographic, obstetric and anthropometric characteristics of the study participants are presented in table I. There was a predominance of maternal age lower than 25 (41.1%) and a low level of education (85.9%). Primigravida was reported by 75.7% of them. The anthropometric status characterized by excess weight (overweight / obesity) was 44.0% in the pre-pregnancy period, and 48.1% during pregnancy (Table I).

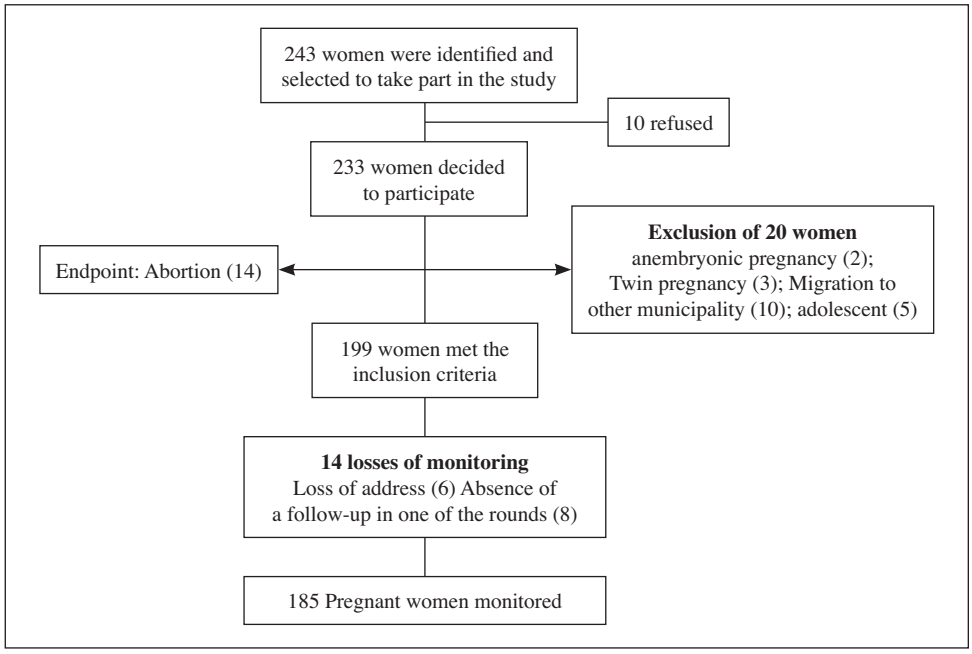

Fig. 1.— Flowchart of the catchment of the sample of the Cohort study. Santo Antônio de Jesus, Bahia, Brazil, 2012-2013.

Table I
Socio-demographic, biological, obstetric and anthropometric characterization of the pregnant women. Santo Antônio Jesus, Bahia, Brazil, 2012-2013 (n=185)

Variables	*N*	*%*
Maternal Age		
< 25 years old	76	41,1
25 to 30 years old	57	30,8
> 30 years old	52	28,1
Maternal Education level		
<Secondary education	159	85,9
≥Secondary education	26	14,1
Family Income		
≤1 Minimum Salary	46	24,9
> 1 Minimum Salary	139	75,1
Number of prenatal appointments		
<7 prenatal appointments	76	41,1
≥7prenatal appointments	109	58,9
Smoking		
Smoker/ex-smoker	16	8,6
Non smoker	169	91,4
Alcohol consumption		
Yes	24	13
No	161	87
Physical		
No	169	91,4
Yes	16	8,6
Number of pregnancies		
Primigravida	140	75,7
Multígravada	45	24,3
Complications in pregnancy		
Yes	49	26,5
No	136	73,5
Maternal height		
<150cm	19	10,3
≥150cm	166	89,7
Pre-pregnancy anthropometric state		
Overweight	82	44,0
Eutrophy/slimness	103	56,0
Anthropometric state during pregnancy	89	48,1
Overweight	96	51,9
Eutrophy/slimness		
Weight gain during pregnancy		
<10Kg	105	56,8
≥10Kg	80	43,2

The loss recorded during the monitoring was 12.1% (n = 24). The most common reasons were those related to failure to locate the address provided by the pregnant woman in the family health unit (6; 2.0%), non-participation in one of the rounds of the study (8; 33.4%) and refusal to participate (10; 41.6%) (Figure 1).

Information on the frequency of consumption of the food groups during pregnancy are shown in table II. The most consumed food groups in the two trimesters of pregnancy were coffee (80.0%), followed by sugar and sweets (74.4%). And the food groups that had a lower consumption value were the pulses (53.7%), followed by fruits (58.0%).

The Kaiser-Meyer Olkin (KMO) values ranged from 0.662 (first trimester) and 0.620 (third trimester); the Bartlett's sphericity test in these two trimesters of pregnancy were statistically significant ($p < 0.001$). These values showed a satisfactory adequacy of the data to the FA technique. The commonality of the data in the first trimester, ranged from 0.318 (Fat group) to 0.749 (fruit group) and in the third trimester ranged from 0.333 (fried snack group) to 0.708 (coffee group).

The Cronbach's alpha indices were acceptable, with values of 0.53 (first trimester) and 0.56 (third trimester), indicating homogeneity of the construct (Table III).

The four patterns of dietary intake identified explained, respectively, 50.4% and 49.3% of the variability of dietary intake in the first and third trimester. The food or food group created new factors, selected from among those which had a factorial loading higher or equal to 0.4; considered to be the largest saturation (Table III).

Thus, in the first trimester the pattern 1 "processed and prepared foods" (processed/industrialized foods, sugar/sweets, coffee and fats) explained 19.4% of food consumption. The pattern 2 "conscious" (Pulses, vegetables, meat and eggs) accounted for 11.2% of food consumption. The pattern 3 "mixed" (cereal/roots/tubers, milk and fried snacks) represented 10.6% of food consumption and the pattern 4 "nutrient" (fruit by default) accounted for 9.1% of this consumption (Table III).

In the third trimester, the pattern 1 "processed and prepared" (processed/industrialized food, meat, eggs, and fried snacks) representeded 14.8% of food consumption. The pattern 2 "traditional" (cereal/roots/tubers, pulses, vegetables/salads, fruit and milk) represented 13.3% of consumption. The pattern 3 "cafeteria" (coffee and butter/margarine) explained 11.3% of consumption and the pattern 4 "caloric" (sugars and sweets) accounted for 10.6% of the food consumption of the pregnant women (Table III).

The factorial scores for coffee and fat in the first trimester, were high (0.727 and 0.732, respectively) and remained high (0.737 and 0.722 respectively) in the third trimester. In addition to these groups, others, such as cereals/roots/tubers, pulses and sugar/sweets kept balanced values in the two trimesters of pregnancy evaluated. The food items fruit, vegetables/ salads, milk/milk products and fried snacks had higher factorial scores in the first trimester. And the groups of industrialized/cured meats, meat and eggs had higher scores in the third trimester (Table III).

It was observed that there was no statistically significant correlation between the four dietary patterns identified in the two trimesters of pregnancy (Table III), which may indicate differences in the dietary intake between the gestational trimesters evaluated.

Table II
Food groups taken from the the FFQ and the per-cent of consumption according to each trimester of pregnacy. Santo Antônio de Jesus, Bahia, Brazil, 2012 a 2013

Group	*Trimester*	*% Consumption*	*Foods*
Cereals, roots vegetables and tubers	1st trimester	64,4	Rice; Pasta; Manioc Flour; Sweet Biscuits; Cakes; Savoury Biscuits; Corn/Maize; Oats; Couscous; Tapioca; Bread; Potato and Cassava.
	3rd trimester	64,4	
Pulses	1st trimester	52,2	Beans and Pidgeon Pea
	3rd trimester	55,2	
Vegetables	1st trimester	67,0	Lettuce; Chayote; Carrot; Collard Greens; Cabbage; Tomato; Pumpkin; Cucumber; Scarlet Eggplant; Onion; Garlic and Peppers.
	3rd trimester	68,4	
Fruits	1st trimester	59,6	Banana; Papaya; Orange; Apple; Watermelon; Pineapple; Tangerine; Breadfruit; Avocado; Mango; Lime; Passion fruit; Guava; Natural Juice and Plantains.
	3rd trimester	56,5	
Sugar and sweets	1st trimester	75,2	Sugar; Caramels and sweets; Powdered chocolate and Guava paste.
	3rd trimester	73,7	
Industrialized products/meat and cured meat products	1st trimester	67,3	Ready-made products (Soft drinks; Artificial Juice; Stock; Ready-made Soup and Sauces). Cured meat products (Linguiça; Mortadella; Carne-do-sol; Jerky and Bacon).
	3rd trimester	65,8	
Milk and milk products	1st trimester	59,8	Whole milk; Cheese; Full-fat Yoghurt and Requeijão.
	3rd trimester	59	
Meat and eggs	1st trimester	66,7	Eggs; Offal; Beef with bones; Boneless Beef; Chicken; Fish and Pork.
	3rd trimester	65,4	
Fat	1st trimester	62,4	Margerine and Butter
	3rd trimester	60,8	
Fried snacks	1st trimester	63,2	Fried Snacks
	3rd trimester	57,3	
Coffee	1st trimester	78,9	Coffee.
	3rd trimester	81,1	

The differences in food consumption were also observed through changes in the behavior of the factorial loading of saturation for some food groups during pregnancy. It was noted that the group of fruits in the first trimester makes up the pattern 4, and in the third trimester they are in pattern 2. The coffee and fat group are featured in the pattern 1 in the first trimester and in the third trimester are in pattern 3. The group of sugars and sweets predominate, in the first trimester, in pattern 1 and in the third trimester change to the pattern 4; the group of fried snacks make up pattern 1 in the first trimester and in the third trimester dominates the pattern 3 (Table III).

Discussion

The results of this study have identified eight patterns of dietary intake, four for each evaluated trimester, and it also allowed one to observe dietary changes during pregnancy, especially for the food groups of fruit, coffee, fats, fried snacks, sugar and sweets. In the first trimester, the pattern of processed and industrialized food were identified, the conscious pattern, the mixed pattern and nutrient pattern.

Among these patterns, the first can be considered a risk factor for the adequate development of pregnancy. In the third trimester there was a traditional pattern identified, along with the processed pattern, the cafeteria pattern and the caloric pattern. In this trimester it was observed that the last three dietary patterns also constitute food that confers risk to maternal health, and consequently to their fetus. The "processed and industrialized" identified in the first and third trimesters, consisting of foods of a high caloric density and low nutritional value, represented especially by foods with a high concentration of sugars such as soft drinks and artificial juices, saturated fat and sodium , and examples like sausages, sun-dried meat and beef jerky.

This pattern, despite containing foods that alone can be considered high in protein, has in its composition a low nutritional value because it contains significant

Table III
Distribution of the Factorial loads for the four components (Dietary patterns) identified in the first and third trimester of pregnancy. Santo Antônio de Jesus, Bahia, Brazil, 2012 to 2013

First trimester of Pregnancy				
Foods/Food groups	*Patterns of dietary consumption*			
	Processed and industrialized	*Conscious*	*Mixed*	*Nutrient*
Sugars and Sweets	0,507	0,203	0,268	0,146
Coffee	0,727	0,027	0,140	0,216
Industrialized products/meat and cured meat products	0,461	0,274	0,079	0,070
Fats	0,737	0,141	0,104	0,096
Pulses	0,238	0,637	-0,210	0,143
Vegetables	-0,122	0,695	0,087	0,024
Meat and eggs	0,039	0,494	0,318	-0,217
Cereals, roots and tubers	0,032	0,199	0,621	-0,113
Milk and Milk products	0,147	-0,109	0,654	-0,254
Fried snacks	0,149	-0,118	0,795	0,194
Fruit	0,055	0,055	0,045	0,861
Eigenvalues	2,54	1,49	1,13	1,05
% explanation of the variance	19,42	11,23	10,68	9,11
% accumulated variance	19,42	30,65	41,34	50,45
Cronbach's alpha	0,51	0,53	0,54	0,56

Third Trimester of Pregnancy				
Foods/Food Groups	*Patterns of dietary consumption*			
	Processed and industrialized	*Traditional*	*Cafeteria*	*Caloric*
Sugars and Sweets	0,599	0,212	-0,031	0,093
Coffee	0,739	-0,073	0,024	0,039
Industrialized products/meat and cured meat products	0,430	0,140	0,163	-0,046
Fats	0,221	0,667	0,174	-0,068
Pulses	0,072	0,649	-0,061	0,151
Vegetables	0,079	0,429	0,043	-0,067
Meat and eggs	0,168	0,504	0,155	0,220
Cereals, roots and tubers	-0,036	0,498	0,293	-0,047
Milk and Milk products	-0,056	0,131	0,732	0,226
Fried snacks	0,091	-0,075	0,722	-115
Fruit	0,293	-0,050	0,131	0,526
Eigenvalues	2,38	1,50	1,17	1,05
% explanation of the variance	14,08	13,28	11,03	10,62
% accumulated variance	14,08	27,37	38,40	49,03
Cronbach's alpha	0,54	0,57	0,57	0,56

Pearson Correlation among the dietary patterns of the first and second trimester of pregnancy: Pattern 1: 0,035 (p=0,6) ; Pattern 2: 0,023 (p=0,7); Pattern 3: 0,085 (p=0,2); Pattern 4: 0,051 (p=0,4).

amounts of cholesterol, saturated fat and sodium; foods known to be associated with morbidity during pregnancy.

The "processed and industrialized pattern" has been identified in the population of pregnant women in several regions of the world[65,17,18,19], and are associated with the changes in the modern world, as the search for greater comfort, convenience and the speed of access and preparation of food, which directly affects the food and nutritional patterns of the population.

This pattern has a large participation in the explanation of the dietary intake of the population, resulting in a higher adherence during pregnancy. Some foods of these patterns should be discouraged during pregnancy for not meeting nutritional recommendations for this phase, and for containing, in their composition, substances that increase the risk of the occurrence of overweight and obesity as well as other harmful conditions during pregnancy, like diabetes, hypertension, dyslipidemia and anemia. Similar patterns that present inadequacies in nutrient and energy levels were reported by other authors as one of the main risk factors for the occurrence of insufficient at weight birth[20], growth restriction and the development of the conceptus[15] and as one of the factors in the development of non-transmissible chronic diseases in adult life, including coronary heart disease and metabolic syndrome[21].

The processed and industrialized pattern, identified during the pregnancy of the women who took part in this study, are not unique to this population group, but express the global dietary pattern, with consequent negative changes in the epidemiological and nutritional profile of the population. In Brazil, similar to other regions of the world, these changes are related to the changes in lifestyle, which are expressed in reducing daily caloric expenditure and the adoption of eating habits characterized by the high consumption of saturated fats, simple sugars, processed products and a reduced consumption of fruits and vegetables. This dietary pattern shows the trend of changing eating habits recorded by research over time[22,23].

The "Cafeteria pattern", identified in the third trimester, consists of foods that contain caffeine and fat, especially saturated, acting in the body as caloric fuel. Coffee, butter and margarine have been evidenced by other researchers, integrating the dietary pattern denominated as traditional[24,25], by being present in the daily dietary intake of the population. It should be noted that coffee, margarine and butter are foods that traditionally make up breakfast, especially coffee, part of the food culture of the population, particularly in the northeast, and is present in the diet of the mothers studied.

It is noted that coffee was the only food included in the factorial analysis in isolation, in other words not integrating any other food group. This can be explained by the high frequency of daily consumption of this food and high factorial score. Results of studies reveal the relationship between caffeine and birth weight. In this sense, caffeine should be demethylated in the placenta to follow its normal metabolic pathway. In the case of difficulty of operation and/or the absence of the enzyme responsible for the demethylation of caffeine in the placenta, this non-demethylate compound remains high and may compromise fetal growth and development, reflected in the low birth weight[26,27]. However, this theory is questioned by other authors, who found no association between caffeine intake and birth weight[28]. According to Fenster et al.[29], only daily doses above 300 mg / day of caffeine pose a risk for the occurrence of low birth weight. It should be kept in mind that caffeine is not only present in coffee but also in other foods such as the tea, soft drinks, and chocolate. Thus, one may speculate that the high consumption of these food items can significantly increase the availability of caffeine in the placenta, requiring an increased placental metabolic load, which, when not performed, increases risk to low birth weight.

The "caloric pattern" provides a high amount of simple sugars and calories and has low nutritional value, in particular in terms of vitamins and minerals. So, this dietary pattern can cause harm to the health of the mother, such as an increase in weight gain, which is associated with greater risk of gestational diabetes, obesity and other, chronic non-transmissible conditions[30,31].

In this study, the "nutrient pattern" is made up of fruits and natural juice; the "conscious pattern" and the "traditional pattern" identified in the first and third trimesters are eating patterns that contribute to the intake of micronutrients, protein, and carbohydrates, especially complex carbohydrates. It should be noted that these patterns contain in their compositions essential nutrients for human health, and make up the dietary recommendations for pregnant women[32]. Thus, they can be associated with better health conditions in pregnant women and fetal growth and development.

Some foods that are part of this pattern, for example: fruits, cereals, roots, vegetables and pulses are part of the pattern diet called 'Mediterranean' in other studies[9,33], and has been associated with appropriate weight gain during pregnancy, protecting women against the occurrence of overweight and obesity during this period[33].

In this study, dietary intake patterns identified in the first and the third trimester of pregnancy explain, respectively, 50.45% and 49.03% of the total variance of dietary intake of pregnant women and allow one to identify the eating habits of the population studied. It was observed that 35.73% of the explained variance in food consumption in the third trimester corresponded to eating patterns consisting of fried snacks, processed foods, sausages, coffee, fats, sugars and sweets, with the consumption of these foods considered a risk to health and nutrition during pregnancy. Therefore, the profile of the dietary intake of the pregnant women in this study is predominantly made up of foods which are high in saturated fats, trans fats, cholesterol, sugars, and sodium; being low in fiber and micronu-

trients. This dietary profile in such a critical period of development, such as pregnancy, causes nutritional problems for the mother, like anemia, low birth weight and/or excess weight, impacting the fetal growth and development and health conditions at the time of birth of the fetus, in particular the birth weight.

In the eating patterns of the pregnant women that make up this study, the presence of food items considered at risk of developing chronic diseases is alarming. Scientific research to date indicates that the prevalence of obesity may be associated with physical inactivity, with the changes in dietary patterns among the population, with an expressive increase in the consumption of high-calorie foods (ready-made industrialized products), free or low in nutrients, and reduced consumption of vegetables and fruits. This pattern of consumption is similar to that observed among the population of this study, and is knowingly associated with negative consequences for the health of the fetus, with repercussions in later life.

Throughout pregnancy, the large-scale adoption and constant eating pattern composed of manufactured products, like meat and sausages, can be noted; however it is worth mentioning that other food groups suffer important changes throughout this cycle. This change is evident in the change in behavior of the saturation of the factorial loading for some food groups. So, it was observed that some food groups considered unhealthy (coffee, fats, sugars, sweets and fried snacks) had a higher notable consumption in early pregnancy and expressively lower consumption in late gestation. While the fruit group, which is considered healthy, presented lower adherence in the first trimester, later transforming into a greater adherence during the pregnancy.

These alterations in dietary intake during pregnancy accompany the physiological changes of each pregnancy. In the first trimester numerous changes occur in the maternal organism, especially in the digestive system; in this phase symptoms of nausea and vomiting are common, while on the other cravings for the same period is reported[12], which could explain the larger consumption of food considered unhealthy.

Another plausible explanation for this finding may be related to the greater access to information on food and nutrition during pregnancy, acquired during prenatal consultations in the second and third trimester. Castro et al[34], in a study with 276 women, focused on the need to target mothers throughout the period of the reproductive cycle and increase their awareness of the importance of healthy eating. These guidelines issued by nutritionists and/or other health professionals are considered positive factors for the determination of food choices throughout the pregnancy[35].

It should be mentioned that repeated measurements of the exposure (dietary intake), provide greater consistency between measurements. However, the limitations inherent in the very collection techniques of the method do not go unnoticed. In this regard, we emphasize that the FFQ method used in this study has limitations, which are expressed in the possible errors of the household measurements and in the consumption frequency, a result of the bias caused by the memory of the respondent. However, methodological safeguards were adopted to minimize these conditions, such as the use of a photo album containing images of the portion size that contributes to the memory of the interviewee.

Another limitation which can be highlighted regards the data analysis. But, in this study, we adopted the method of factorial analysis with the principal components technique, which are considered robust to identify patterns of dietary intake. Still, this method does not escape criticism, mainly related to the subjectivity in determining the number of factors to be extracted and the aggregation of the food groups. In this study, to minimize these problems, we used the methodological and statistical assumptions for the application of analysis, and the number of factors to be extracted followed the recommended procedures[10,36].

One other aspect to be considered, with respect to losses during the monitoring, for contributing with selection bias in the sample investigated; But the losses were negligible in this study (12%) in approximately 9 months of monitoring, making it unlikely that these losses have produced bias in this study, and possibly do not constitute a methodological concern.

Thus, despite the above limitations, it is speculated that they have not affected the results of this study, for having been carefully handled and controlled throughout the study.

Conclusion

The results of this study reveal eight patterns of food consumption during pregnancy, four for each trimester evaluated. Also, it could be noted that there have were changes in the adoption of food patterns throughout the trimesters evaluated during the pregnancy, especially for the food groups of fruit, coffee, fats, fried snacks and sugar and sweets. These changes in dietary intake accompany the physiological changes specific to each pregnancy; which should be considered in the evaluation of consumption and the development of food and nutritional education.

Thus, it is understood that the results of this study are consistent and relevant for characterizing the dietary patterns of women during pregnancy, which is rare knowledge in Brazil. It is expected that the results of this study can aid the implementation of more effective public policies towards the adoption of a more balanced and adequate diet for this stage of life, contributing to better pregnancy outcomes and reducing risks to the mother and child's health.

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