






The association among the consumption of ultra-processed food and body image, nutritional status and physical activity of pregnant women at the primary health care


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Abstract

Objectives: to analyze the consumption of ultra-processed food and its association with body image, physical activity, nutritional status and self-assessment on food of pregnant women enrolled in the Primary Health Care.

Methods: this is a cross-sectional study carried out with pregnant women enrolled in the Family Health Strategy in the city of Montes Claros, Minas Gerais. Data were collected through a questionnaire. The dependent variable was the consumption of ultra-processed food, and the independent ones addressed body appearance, physical activity, nutritional status, self-assessment on food and food consumption. Descriptive analysis was carried out and for association of analysis, the linear regression model was used with crude and adjusted associations.

Results: 1,185 pregnant women participated in the study. Caloric intake from ultra-processed food represented 32.0% of these women's daily diet. There was an association between consumption of ultra-processed food and physical activity ($\beta=-0.08$; $p<0.01$), pre-gestational nutritional status ($\beta=-0.12$; $p<0.01$) and body image ($\beta=0.08$; $p=0.01$).

Conclusion: the pregnant women presented high consumption of ultra-processed food. Having a negative body image, the lowest level of physical activity, and high pre-gestational nutritional status are conditions that influenced the consumption of these food.

Key words *Pregnancy, Maternal nutrition, Industrialized food, Fast food, Primary health care*



Introduction

Pregnancy is a phase that requires special care, such as adequate food. During this period, the levels of nutrients in tissues and liquids undergo physiological and chemical changes, requiring adjustments in the eating habits, since the nutritional status can influence the outcome of the pregnancy, delivery and postpartum.^{1,2}

It is essential that pregnant women adopt a healthy diet, which consists of eating food with a balanced nutritional composition. However, the world's population diet has been undergoing major changes. The social life, inside and out of home, has been weakened by the reduced consumption of *in natura* (fresh) or minimally processed food, associated with the increased intake of ultra-processed food,¹ which have high levels of fat, sodium, and sugar, and consequently high calorie content, and low micronutrient content.³

Ultra-processed food (UPF) are defined as industrial formulations, with little or almost no whole food. Their manufacture involves different processing steps and techniques, such as the addition of ingredients synthesized in a laboratory in order to make them more palatable for consumption.³ Different factors may contribute to a larger consumption of UPF: demographic, socioeconomic,^{2,3} cultural, lifestyle³ and nutritional status.^{2,4,5}

The consumption of UPF during pregnancy is associated with higher risks to develop maternal overweight and obesity,^{1,6} factors that may lead to different conditions, such as gestational diabetes mellitus, preeclampsia,⁷ cesarean delivery, and large-for-gestational-age (LGA) newborns.²

Identifying pregnant women's eating patterns constitutes of an important object of study for nutritional epidemiology, in order to promote maternal and child health, which is a priority issue for public health worldwide.¹ Thus, considering the increased consumption of UPF by the general population, and the scarcity of information that measures this relation to consumption among pregnant women with different factors, this study aimed to analyze the consumption of ultra-processed food and its association with body image, physical activity, nutritional status and self-assessment of food in pregnant women enrolled in the Family Health Teams of Primary Health Care.

Methods

This is an epidemiological, population-based, cross-sectional, analytical study. This study is a part of the first phase of the matrix research entitled "*Estudo ALGE - Avaliação das condições de saúde das gestantes de Montes Claros - MG*".

The population was made up of pregnant women registered in teams of the Family Health Strategy (FHS), in the urban area of the city of Montes Claros, between 2018 and 2019. The sample size calculation considered population parameters with a prevalence of 50%, 95% confidence interval (CI95%), and precision level of 2.0%. Correction was made for finite population (n=1,661 pregnant women) with an addition of 20% to compensate for possible non-responses and losses. The calculations showed the need of participation of at least 1,180 pregnant women.

The inclusion criteria were: being registered in the family health team, at any gestational age. The excluded were: pregnant with twins and with cognitive impairment, according to information from the family and/or the FHS team.

Data collection was carried out between the months of October 2018 and November 2019, in the units of the FHS teams or in the participants' homes according to their availability. Prior to the collection, the interviewers were trained, as well as a pilot study with pregnant women enrolled at the FHS (who were not included in the study analyses), to standardize the research procedures.

A questionnaire with demographic, socioeconomic, body shape, lifestyle, nutritional status, self-assessment and food consumption Variables was used:

(a) *Demographic characteristics*: age (up to 20 years; 21 to 30; over 30); self-reported skin color (white; non-white); marital status (with partner; without partner).

b) *Socioeconomic characteristics*: years of study (≤ 8 ; 9-11; > 11); work outside the home (yes; no); family income (≤ 1 minimum wage; > 1 minimum wage).

c) *Body image*: to assess body attitudes of pregnant women, the Body Attitudes Questionnaire (BAQ) was applied, an instrument validated in Brazil by Scagliusi et al.⁸ The instrument has 44 items on a Likert scale with five response options ("I totally agree" to "I totally disagree"). The total score of the BAQ was the sum of the scores for each item. This value varies from 44 to 220 points, and the higher the score obtained, the greater the dissatisfaction with body image on the six subscales: "physical attractiveness", "self-depreciation", "total fat", "body protrusion", "perceived fat in the lower portion of the body", and "strength and physical fitness".⁹

d) *Physical activity*: to assess the pregnant women's energy expenditure, we used the *Questionário de Atividade Física para Gestantes* (QAFG) (Physical Activity for Pregnant Women Questionnaire). The instrument was adapted and validated for the use in pregnant women in Brazil by Silva et al.¹⁰ and aims to assess the levels of physical activity in different categories, such as household chores, taking care of people, sports and exercise, occupation, and leisure. The estimated intensity of the

QAFG results from the average MET/hour (metabolic equivalent) per week for the total activities performed. With this, each activity is classified by its intensity into physically inactive (<1.5 METs), mild (1.5 - <3.0 METs), moderate (3.0 - 6.0 METs) or vigorous (>6.0 METs).¹⁰

e) *Pre-pregnancy nutritional status*: the assessment of pre-pregnancy nutritional status was carried out according to the recommendations of the Ministry of Health.¹¹ Data on weight in kilograms (kg) and height in centimeters (cm) were collected from the pregnant woman's medical card. Then, the Body Mass Index (BMI) was calculated and classified as: low weight, eutrophic, overweight, and obese. For analysis, the overweight and obesity categories were added.

f) *Self-evaluation on food*: was obtained through the question "How do you evaluate your eating habits?" with the following answer the options were: "very good", "good", "regular", "bad", and "very bad". Later, for analysis purposes, these answers were dichotomized into positive (very good/good), and negative (regular/bad/very bad).¹²

g) *Food consumption*: measured by the *Questionário de Frequência Alimentar* (QFA) (Food Frequency Questionnaire), adapted and validated for use in pregnant women assisted in the basic health units. The QFA contains 70 food items with eight frequency categories corresponding to more than 3 times a day, 2 to 3 times a day, once a day, 5 to 6 times a week, 2 to 4 times a week, once a week, 1 to 3 times a month and never/almost never.¹³

Regarding to UPF, the consumption of soft drinks, fries, ice cream, chocolate milk, artificial juice, frankfurter, hamburger, pizza, packaged snacks, margarine, and sweets were analyzed. These items were selected according to the NOVA classification, which divides and organizes food into four categories according to the nature, extent, and purpose of the industrial processing to which they are submitted: (1) fresh or minimally processed food; (2) cooking ingredients; (3) processed food, and (4) UPF.³

The QFA data were organized in a spreadsheet for analysis of the nutritional value of individual diets. The consumption frequencies of the different food items were transformed to daily values using the Diet Pro® software. Nutritional calculations were performed for all kinds of food ingested, using as references the *Tabela de Composição de Alimentos*: (Food Composition Table) support for nutritional decision making and the *Tabela Brasileira de Composição Química dos Alimentos* (TACO) (Brazilian Table of Chemical Composition of Food).¹⁴

To find the Total Energy Value (TEV) of the food, the macronutrients were calculated in grams and multiplied by 4 kilocalories (kcal) (Protein and Carbohydrate) and 9kcal (Lipids).¹⁴ From the TEV found, the following calculation was performed to identify the percentage of the UPF consumption present in the pregnant woman's diet:

$$\text{Percentage of UPF ingested} = \frac{\text{ultra-processed kcal} \times 100}{\text{total kcal}}$$

TEV registration on food lower than 500 kcal or higher than 7.000 kcal were excluded based on cut-off points established in the literature, since these data are considered biologically implausible for consumption.¹⁵

Descriptive data analysis was performed with absolute and relative frequency measures for categorical variables. Then, simple linear regression analyses were performed between the outcome variable (consumption of ultra-processed food) and the independent variables (body image, physical activity, pre-pregnancy BMI, and self-assessment on food). The variables that presented a descriptive level (*p* value) of up to 20% in the simple linear regression were selected for multiple analysis. In this step, the selection of variables for the final model adjustment considered the backward selection procedure.

The adjusted model met the linear regression assumptions. The independence of the residuals was confirmed by the Durbin-Watson thesis (DW=1.976). There was no multicollinearity (the degree of tolerance was close to 0.9 and VIF below 10) and no outliers (the values were within the range of -3/+3). In the graphical analysis, the distribution of residuals was within the normal range. The homoscedasticity was also confirmed by means of the Scatterplot graphic, in which it was verified that the points were randomly dispersed and not conical. Pearson's correlation coefficient was also used to verify a linear relation between the dependent variable and the model's independent variables.

The data collected were organized and analyzed by using IBM SPSS Statistics version 22.0 for Windows®.

This study was conducted within the Resolution standards 466/2012, and the research project was approved by the Research Ethics Committee at the *Universidade Estadual de Montes Claros* (protocol n° 2.483.623/2018).

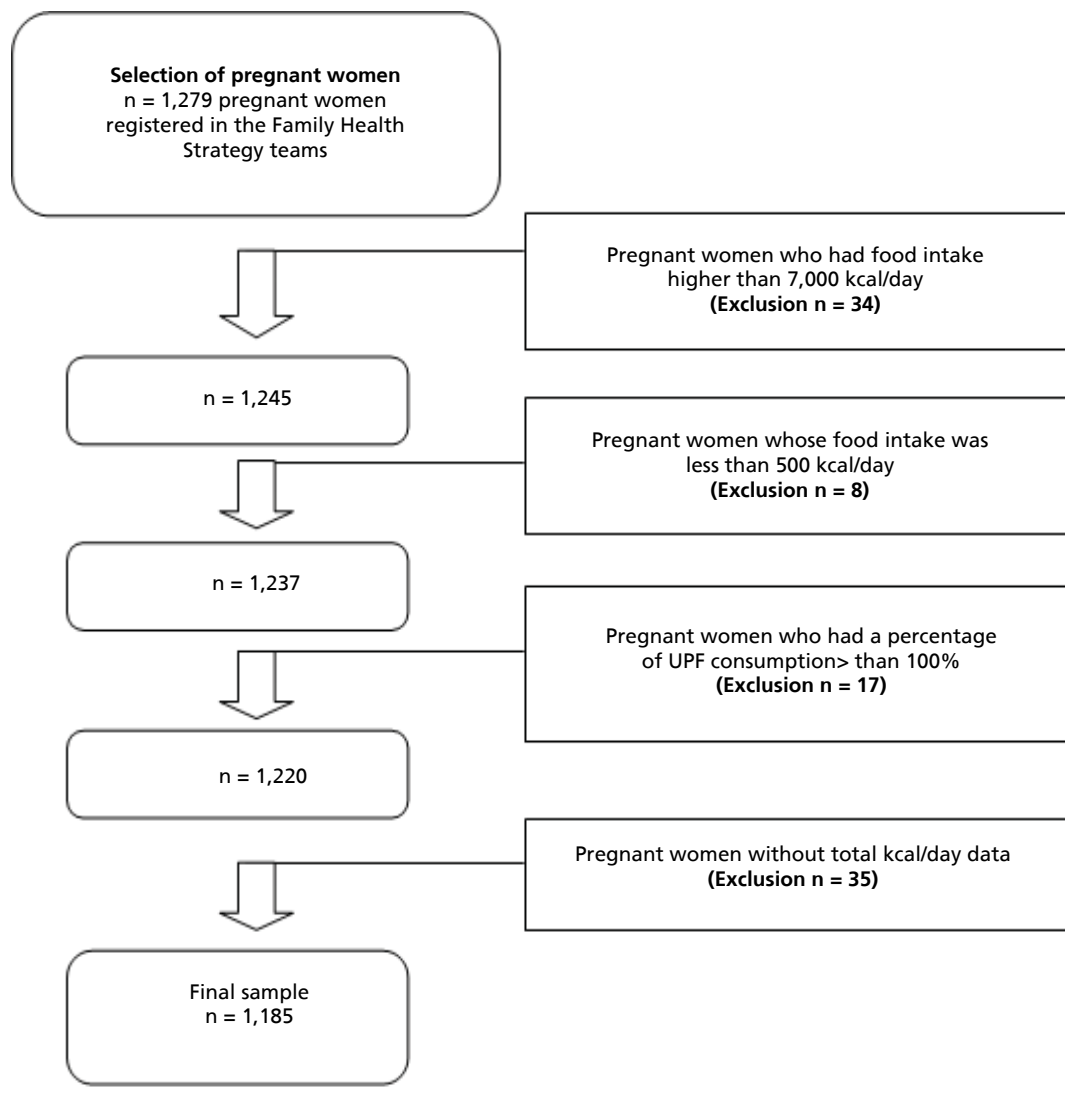
Results

Of the 1.279 pregnant women who participated in the survey, 94 (7.3%) were excluded because they had energy intake values of less than 500 Kcal or more than 7,000 Kcal and those who did not provide information for calculating total of Kcal/day (final n = 1,185) (Figure 1).

The sample included 1,185 pregnant women, with a mean age of 26,6 years (SD ± 6,6). About 65,0% had between nine and eleven years of schooling, 88.9% self-reported non-white, 77.4% were married or living in a stable union, 56.2% did not work outside the home, and 64.6% had an income less than or equal to one minimum wage. Regarding body image, 48.0% of the pregnant women presented a negative image. Regarding lifestyle, 66.5% reported practicing some physical activity during

Figure 1

Flowchart of the selection on pregnant women participating in the study. Montes Claros, MG, 2018-2019.



the day. In addition, 47.0% of them had an adequate weight before becoming pregnant and 66.9% considered that they had a positive diet (Table 1).

The analysis of the QFA showed that the pregnant women's mean total calorie intake was 2,559.2 kcal/day (SD \pm 1.206,7), with 746.3 kcal/day (SD \pm 569.5) from ultra-processed food, representing 32.0% (SD \pm 22.1) these women's diet.

Table 2 presents the results of the linear regression analysis. In the simple linear regression analysis, it was observed up to 20% of UPF association with physical activity ($p=0.01$), pre-pregnancy nutritional status ($p<0.01$), body image ($p=0.16$) and self-assessment on food ($p=0.14$). In multiple analysis, there was significant association of UPF with: physical activity ($\beta=-0.08$;

$p<0.01$), pre-pregnancy nutritional status ($\beta=-0.12$; $p<0.01$), body image ($\beta=0.08$, $p=0.01$).

Discussion

In the present study, an association between consumption of UPF and the variables of body image, physical activity and pre-pregnancy nutritional status was verified. These data lead to a reflection on the importance of encouraging changes in women's lifestyle during pregnancy to provide health to the mother-child binomial.

The Brazilian population's food guide for pregnant women's¹⁶ guidance states that UPF are nutritionally unbalanced and, its consumption should be avoided. Therefore, it is considered that in this study there was

Table 1

Sociodemographic characteristics, body image, physical activity, nutritional status and self-assessment on food for pregnant women assisted in the primary health care in the city of Montes Claros, Minas Gerais, Brazil, 2018-2019 (N=1.185).

Variables	N ^a	%
Maternal age (years)		
Up to 20	251	22.1
21 - 30	557	49.0
> 30	328	28.9
Years of study		
≤8	174	14.7
9-11	772	65.3
>11	237	20.0
Self-reported skin color		
White	131	11.1
Non-white	1044	88.9
Marital Status		
With partner	915	77.4
Without partner	267	22.6
Works out of home		
Yes	519	43.8
No	665	56.2
Family income (Minimum wage)^b		
≤ 1	736	64.6
> 1	404	35.4
Body Image		
Positive	595	52.0
Negative	549	48.0
Physical Activity		
Physically Inactive	242	23.5
Mild	443	37.4
Moderate/vigorous	345	29.1
Pre-pregnancy nutritional status		
Low weight	71	7.3
Adequate	460	47.0
Overweight/Obesity	447	45.7
Self-assessment on food		
Positive	788	66.9
Negative	390	33.1

^aN total of variables (differences in the sample total are referring to lack of information); ^bBrazilian minimum wage: considering the average value of the years 2018 and 2019 (R\$976,00).

Table 2

Factors associated with the percentage of ultra-processed food consumption (%E) among pregnant women registered at the Primary Health Care. Montes Claros, Minas Gerais, 2018-2019 (N=1.185).^a

Variables	Ultra-processed food consumption			
	Crude analysis		Adjusted analysis	
	β (CI95%)	p	β (CI95%)	p
Physical activity	-0.07 (-1.65; -0.19)	0.01	-0,08 (-1.97; -0.32)	<0.01
Pre-pregnancy BMI	-0.09 (-0.63; -0.12)	<0.01	-0.12 (-0.81; -0.24)	<0.01
Body image	0.04 (-0.02; 0.13)	0.16	0.08 (0.02; 0.20)	0.01
Self-assessment on food	0.04 (-0.30; 6.30)	0.14	0.05 (0.28; 5.78)	0.07

^aAccording to the Linear Regression models adjusted by the Backward method.

a high prevalence (32,0%) of consumption of these food by pregnant women. A previous study conducted in an observational cohort on pregnant women in North Carolina, in the United States, also found a mean consumption of ultra-processed food of 34,0%.¹⁷ Other international researches found higher rates reference to this percentage of food consumption among pregnant women: 54,4% in the United States,¹⁸ 50.7% in the United Kingdom,³ 48,0% in Canada.¹⁹

In Brazil, a similar result was found in a survey on food intake of pregnant women being assisted in the public health service in Ribeirão Preto (SP), with a mean total calorie intake of 2.053kcal, 32,0% of which were ultra-processed food.⁶ Other national studies on pregnant women found a percentage of processed food consumption that ranged from 22.2% to 38,0% of daily diet.^{2,20,21}

The UPF participation in the population's food routine has been increasing, including among pregnant women. There are differences in the rates of this contribution in the developed countries that may be related to socioeconomic and cultural issues on food choices in each country.²

The increased consumption of ultra-processed food has been related to increased occurrences of gestational diabetes mellitus, hypertensive syndromes, nutritional deficiencies, and excessive weight gain during pregnancy.^{1,2,6} UPF, besides having high concentrations of hydrogenated (trans) fat, free sugar, and salt, have a high energy density, low nutritional density, and scarcity of fiber, making the feeding pattern favorable to maternal and neonatal health impairment.^{2,18}

In this study was observed that the consumption of UPF was higher among pregnant women who practiced less physical activity. A study conducted in the United States found a reduction in the level of physical activity of women throughout the pregnancy, associated with a higher frequency of meals in fast food restaurants and highly dense and palatable foods.²² A study conducted in Brazil with the adult population also found an inverse association between UPF consumption and the level of physical activity.²³

Higher levels of sedentarism, associated with increased consumption of empty calories from ultra-processed products, may favor an imbalance of energy intake and expenditure, resulting in greater weight gain, with negative repercussions for the mother and fetus.^{22,24}

We expected to find a positive association between higher UPF consumption and higher pre-pregnancy BMI. However, the results of the present study showed an inverse relationship. The association of dietary patterns and gestational weight gain has been previously evaluated in some studies that identified variations in food intake from preconception to gestation.^{4,5,24} A study conducted

with Australian pregnant women with high pre-pregnancy BMI showed that after undergoing a process of lifestyle counseling, these women showed significant improvement in eating habits throughout the pregnancy.⁴

In a prospective cohort conducted in a public health center in the city of Rio de Janeiro, with Brazilian pregnant women of adequate weight, the intake of UPF decreased, while the intake of minimally/unprocessed food increased slightly from preconception to gestation.⁵

The reverse causality in this study may be associated with pregnant women's possible changes in the eating habits and the lifestyle justified by the concern of these women to maintain an adequate weight gain during pregnancy, avoiding the development of overweight-related to health complications for themselves and their babies.^{1,25}

These data reinforce the importance of nutritional monitoring during prenatal care, which should occur from the beginning of the pregnancy to identify food inadequacies and nutritional status and, based on this, propose changes in the woman's food intake that can prevent maternal-fetal complications. Pre-pregnancy weight can directly influence the size of the baby at childbirth, the development of hypertension and gestational diabetes, cesarean delivery, as well as the mother's nutritional status in the postpartum period.¹

Pregnant women who had higher BAQ scores, indicating greater body dissatisfaction, consumed more ultra-processed products. A study conducted with pregnant women at the Obstetric Center of the University of Leipzig, Germany, during prenatal consultations, found that uncontrolled eating was a specific risk factor for body image concern in the late pregnancy.²⁶ Other international and national researches have also shown significant correlations among inadequate eating attitudes, such as dietary restrictions, eating disorders, and greater dissatisfaction with the body image.^{9,27,28}

This finding suggests that greater concern with the body image can lead to dysfunctional eating attitudes, such as skipping meals, or replacing the main meals of the day with snacks consisting of food with high energy density, such as UPF, which for pregnant women is even more worrisome because of the negative consequences for both her and the fetus, such as miscarriages, low birth weight, obstetric complications, and postpartum depression.⁹ Although this elaboration is a predictor for pregnant women's behaviors, there is a lack of evidence about its influence on the practice of UPF consumption.

Even though there was no significant association with the outcome of this study, self-assessment on food showed a positive relation with increased consumption of UPF. It is noteworthy that studies addressing this relation among pregnant women are scarce. The results of Machado *et al.*,¹²

with an adult population, oppose those of this investigation, with adults residing in the South region of Brazil, showed a direct association between positive self-perception of diet and adequate eating habits.¹²

These divergences between the results of the studies may stem from the limited knowledge of pregnant women have about diet and healthy eating and the risks of consuming ultra-processed food. Many UPF give the false impression of being healthy because their description includes the addition of dietary fiber and some micronutrients, besides the idea of replacing sugar with artificial sweeteners, or reducing sodium.^{3,29,30} It is considered that evaluating self-perception on food and a quality of a diet for the pregnant women together with new studies would be relevant, since it allows to identify these women eating habits and their relation with a healthy diet, thus contributing to a better development of their pregnancy.

Thus, it is necessary that professionals properly guide pregnant women about the quality of food, since normally a healthy and varied diet will be able to meet all their nutritional needs. They should always give preference to fresh or minimally processed food and cooking preparations over ultra-processed food.¹

The present study presents as a limitation the possibility of memory bias that may interfere with the interviewee's ability to report the frequency of food intake. This fact was minimized by choosing the QFA, validated for pregnant women assisted at the basic health units in the city of Montes Claros, MG.¹⁴

In conclusion, the results of this study indicate a high consumption of ultra-processed food by pregnant women and having a negative body image, lower level of physical activity and high pre-pregnancy nutritional status influence the consumption of these food. The study data also suggest the importance of health professionals, during prenatal care, to guide women, their partners and/or family members on how to identify the different food groups according to the level of industrial processing, as well as their benefits and harms.

It is also important that pregnant women are instructed about appropriate weight gain during pregnancy, about the practice of physical activities that together may contribute to better health outcomes for the mother and baby, in addition to greater clarification and psychological support about the body changes that are necessarily associated with pregnancy.

Authors' contribution

Rodrigues CAO: conception and planning of the study, statistical analysis and interpretation of data, drafting or reviewing the manuscript.

Leão GMMS, Crivellenti LC: statistical analysis and interpretation of data, drafting or reviewing the manuscript.

Andrade RES, Freire RS: manuscript preparation or review.

Silveira MF: data collection, statistical analysis and interpretation of data, writing or reviewing the manuscript.

Silva RRV, Brito MFSF: conception and planning of the study, data collection, writing or reviewing the manuscript.

Pinho L: conception and planning of the study, data collection, statistical analysis and interpretation of data, drafting or reviewing the manuscript.

All authors approved the final version of the article and declare no conflict of interest.

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Received on November 1, 2022

Final version presented on March 2, 2023

Approved on March 22, 2023

Associated Editor: Melânia Amorim