Prevalence, associated factors and reproductive outcomes related to excessive gestational weight gain

Prevalência, fatores associados e desfechos reprodutivos relacionados ao ganho de peso gestacional excessivo

Prevalencia, factores asociados y resultados reproductivos relacionados con el aumento excesivo de peso durante la gestación

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ABSTRACT

Objective: to evaluate pre-gestational nutritional status and weight gain during pregnancy, and to investigate factors associated with excessive weight gain (EWG) among women. **Method:** this study used secondary data on 747 women following childbirth in the "Born in Belo Horizonte" study. Prevalence, prevalence ratio and 95% confidence intervals were calculated. Differences in prevalence were assessed by Pearson chi-square test. **Results:** according to the data, 31% were overweight before pregnancy and 21% had EWG during pregnancy. EWG was higher among women with little schooling (26.9%), multiparous women (32.0%), those who consumed alcohol (29.5%), had antenatal care in the public service (25.4%), attended few appointments (26.5%) or had high-risk pregnancies (33.9%). Women with little schooling, antenatal care in public service, and high-risk pregnancies were more likely to have EWG. Caesarian delivery (52.6%) and macrosomia (6.6%) were more prevalent among those with EWG. **Conclusion:** Excess weight before pregnancy and excessive weight gain during pregnancy were observed, especially among more socially vulnerable women, resulting in unfavorable reproductive outcomes.

Descriptors: Weight Gain; Pregnant Women; Prenatal Care; Obstetric Nursing.

RESUMO

Objetivo: avaliar o estado nutricional pré-gestacional, o ganho de peso durante a gestação, e investigar fatores associados ao ganho de peso excessivo (GPE) entre mulheres. **Método:** estudo com dados secundários de 747 puérperas da pesquisa "Nascer em Belo Horizonte". Calculou-se prevalência, razão de prevalência e intervalos de 95% de confiança. Utilizou-se teste qui-quadrado de Pearson para avaliar diferenças das prevalências. **Resultados:** de acordo com os dados, 31% tinham excesso de peso pré-gestacional e 21% apresentaram GPE na gestação. Mulheres com baixa escolaridade (26,9%), multíparas (32,0%), que consumiam álcool (29,5%), com pré-natal no serviço público (25,4%), poucas consultas (26,5%), e gestação de risco (33,9%) apresentaram maior GPE. Tiveram maior chance de GPE mulheres com baixa escolaridade, pré-natal em serviço público e gestação de risco. Cesariana (52,6%) e macrossomia (6,6%) foram mais prevalentes entre aquelas com GPE. **Conclusão:** observou-se excesso de peso pré-gestacional, ganho ponderal excessivo na gravidez, principalmente em gestantes com maior vulnerabilidade social, resultando em desfechos reprodutivos desfavoráveis.

Descritores: Ganho de Peso; Gestantes; Cuidado Pré-Natal; Enfermagem Obstétrica.

RESUMEN

Objetivo: evaluar el estado nutricional pregestacional y el aumento de peso durante el embarazo, e investigar los factores asociados con el aumento de peso excesivo (EWG) entre las mujeres. **Método:** este estudio utilizó datos secundarios de 747 mujeres después del parto en el estudio "Nacidos en Belo Horizonte". Se calcularon la prevalencia, la razón de prevalencia y los intervalos de confianza del 95%. Las diferencias en la prevalencia se evaluaron mediante la prueba de chi-cuadrado de Pearson. **Resultados:** según los datos, el 31% tenía sobrepeso antes del embarazo y el 21% tenía EWG durante el embarazo. El GTE fue mayor entre las mujeres con poca escolaridad (26,9%), las multíparas (32,0%), las que consumían alcohol (29,5%), tenían atención prenatal en el servicio público (25,4%), asistían a pocas citas (26,5%) o tenían embarazos de alto riesgo (33,9%). Las mujeres con poca escolaridad, atención prenatal en el servicio público y embarazos de alto riesgo tenían más probabilidades de tener EWG. El parto por cesárea (52,6%) y la macrosomía (6,6%) fueron más frecuentes entre las personas con EWG. **Conclusión:** Se observó exceso de peso antes del embarazo y aumento de peso excesivo durante el embarazo, especialmente entre las mujeres más vulnerables socialmente, lo que resultó en resultados reproductivos desfavorables.

Descriptores: Aumento de Peso; Mujeres Embarazadas; Atención Prenatal; Enfermería Obstétrica.

INTRODUCTION

Changes in pregnancy require greater energy inputs[1] that should be no less than 1800 kilocalories (kcal) per day[2]. In this phase, women must diversify their food, guarantee a diet rich in proteins (10-35%), lipids (20-35%), carbohydrates (46-65%), vitamins and minerals[2], and meet these energy and nutritional needs for adequate fetal development and growth[1,2].

Physiological weight gain occurs due to the development of the fetus and annexes, such as placenta, membranes and fluids[3], and must meet recommended limits that depend on pre-gestational weight. The total gain during pregnancy and the average weekly gain in the second and third trimesters are 12.5-18 kilograms/kg (0.51 kg/week) for underweight women, 11.5-16 kg (0.42 kg/week) for normal weight, 7-11.5 kg (0.28 kg/week) for overweight women and 5-9 kg (0.22 kg/week) for obese[4,5].

These limits have been questioned for considering appropriate that a healthy woman gains up to 16 kg, more than double of what has already been shown sufficient (7 kg)[3,6]. In addition, excessive weight gain (EWG) can harm fetal development and cause unfavorable reproductive outcomes[1,6], such as macrosomia[7], gestational diabetes[7,8], eclampsia[9] and maternal death[10].

The aim of antenatal care is to monitor pregnancy and ensure adequate fetal development, thus, it is an opportunity for healthy eating guidance[11]. However, problems related to the quality of care remain, such as the absence of assessment and guidance on weight gain, or no critical assessment of the risks of excessive weight gain[11].

The increasing and high prevalence of overweight and obesity in the Brazilian population in the last decade[12], following global trends, including young women of reproductive age, even before becoming pregnant[13], increases the chances of unfavorable obstetric outcomes and reinforces this concern. Considering this increase in obesity and the importance of identifying and providing guidance on the appropriate gestational weight gain, in addition to the risks for mother/fetus/newborn, the aim of this study was to assess the pre-gestational nutritional status, the weight gain during pregnancy, and investigate the factors associated with excessive weight gain among women.

METHOD

This study was conducted using data from the survey "Birth in Belo Horizonte: survey into labor and birth", a retrospective hospital-based cohort conducted in 2011-2012. The total of 1,088 mothers were interviewed, a significant sample for the municipality. The study followed the same methodology as the national survey "Birth in Brazil: national Survey into Labor and Birth"[14], but unlike other Brazilian capitals, 11 out of the 14 maternity hospitals in the municipality were included.

Data analysis was performed in the second half of 2019. Postpartum women with incomplete records for the main variables of interest were excluded: women without records for the two variables that compose weight gain (n=115), without records of pre-gestational weight or height (n=177) and with previous diseases (heart disease, arterial hypertension with continued treatment, severe anemia, systemic lupus erythematosus, hyperthyroidism, non-gestational diabetes, chronic kidney disease, epilepsy and stroke) according to hospital records (n=49). In the end, 747 women participated. Sensitivity analysis was performed and there were no differences in the outcomes between groups.

Gestational weight gain was determined from the following questions: "What was your weight before falling pregnant?" and "What was your weight in the last prenatal visit?", both recorded in Kg. By subtracting the final weight from the weight before pregnancy, was found the total weight gain during pregnancy, which was later divided by corrected gestational age, thus obtaining the weekly weight gain.

Gestational age (GA) was calculated by means of an algorithm that organized the methods of estimating GA at birth by following the descending order of preference of the methods: 1- ultrasound at any GA recorded on the prenatal card, 2- GA based on ultrasound recorded in the woman's medical record, 3- GA reported by the woman in the interview, 4- GA based on the date of the last menstrual period (LMP) and recorded in the woman's medical record, 5- LMP recorded in the puerperal woman's medical record, and 6- LMP recorded in the puerperal woman's interview.

The pre-gestational Body Mass Index (BMI) was used to detect cases of obesity or malnutrition before pregnancy, or up to 13 weeks of pregnancy, and was calculated from the weight and height measurements before pregnancy collected in the interview. The formula "BMI = Weight / (height)^2" was used, and results were classified as follows: eutrophic (≥ 18.5-24.9 kg/m^2), underweight (<18.5 kg/m^2), overweight (≥ 25-29.9 kg/m^2) and obese (≥30 kg/m^2), in line with national and international recommendations[4].

The excessive weight gain was classified as yes (1) and no (0), based on the maximum values of weekly weight gain obtained according to the category of pre-gestational BMI. The methodology used meets the most recent international recommendations[4] adopted by the Ministry of Health[5].

The prevalence for each category of pre-pregnancy BMI was calculated. For each category, the mean and standard deviation (SD) of total weight gain and weekly weight gain during pregnancy were calculated. Then, the prevalence,

prevalence ratio (PR) and respective 95% confidence intervals (95%CI) of the excessive weight gain were calculated, according to sociodemographic factors, age group (14-19, 20-29, 30-39 and 40-55 years), schooling (0-8, 9-11, 12 or more years of study), race/color (white, black/mixed race, yellow/Asian/indigenous), marital status (with or without partner), occupation (worker or non-worker), parity (primiparous, secondary and multiparous), number of residents in the household (1-4, ≥5), alcohol and tobacco consumption during pregnancy (yes, no), and type of prenatal care (private, public or both), number of antenatal consultations (≥6, <6) and risk classification (pregnant women at risk: yes or no). The PR was estimated using Poisson Regression[15]. The Pearson's chi-square test was used to assess differences in prevalence and the p-value ≤0.05.

Finally, the prevalence, odds ratio (OR) and 95% confidence intervals of immediate reproductive outcomes were estimated in the presence of excessive weight gain through logistic regression - in view of rare reproductive outcomes, except for cesarean section. Reproductive outcomes were the mode of delivery (vaginal and cesarean), prematurity (yes, no), low birth weight (yes, no) and macrosomia (yes, no).

The study "Birth in Belo Horizonte: Survey into labor and birth" was approved by the Research Ethics Committee of the Federal University of Minas Gerais - UFMG under opinion number 2.804.828, authorized by the heads of the maternity hospitals and by women or their legal representatives (in case of adolescents) after signing the Informed Consent form.

RESULTS

Women who were overweight before becoming pregnant represented 31% of the sample. Mean (±SD) of total weight gain during pregnancy ranged from 8.6 (±1.07) kg for obese women to 13.0 (±0.25) kg for eutrophic women (Table 1).

TABLE 1: Pre-gestational BMI and average total and weekly weight gain during pregnancy. Belo Horizonte, MG, Brazil, 2012.

Pre-gestational BMI	n	%	Mean weight gain during pregnancy	
			Total mean (SD)- Kg	Weekly Mean *(SD) –Kg
Eutrophy	470	62.9	13.0 (0.25)	0.337 (0.06)
Underweight	45	6.0	12.8 (0.70)	0.332 (0.18)
Overweight	157	21.0	11.6 (0.52)	0.301 (0.13)
Obesity	75	10.0	8.6 (1.07)	0.222 (0.02)
Total	747	100.0		

Weekly weight gain corrected by the gold standard GA. BMI - Body Mass Index; BH - Belo Horizonte; SD - Standard deviation; Kg- Kilograms.

Approximately 21% of women had excessive weight gain during pregnancy. In addition, an association was observed between sociodemographic and healthcare factors with excessive weight gain (Table 2). The highest prevalence of excessive weight gain was observed among women aged 20-39 years (21.4% aged 20-29 years and 22.4% 30-39 years), with low schooling (26.9%), black/mixed race (22.1%), without a partner (23.3%), who lived in houses with more than five people (27.3%), multiparous (32.0%), who consumed alcohol (29.5 %) and tobacco (29.8%), underwent antenatal care in the public service (25.4%), with few antenatal consultations (26.5%) and high risk pregnancies (33.9%).

Women with low schooling (0-8 years of study) had a higher prevalence ratio (PR) of excessive weight gain compared to women with high educational level (12 or more years) (PR=1.76; 95%CI 1.08-2.86). There was also an association between antenatal care in the public service (PR=1.59; 95%CI 1.13-2.23) and high-risk pregnancies (PR=1.84; 95%CI 1.25-2.71) with excessive weight gain.

When considering excessive weight gain as a risk for reproductive outcomes, a higher prevalence of cesarean sections (52.6%) and macrosomia (6.6%) was observed among women who gained weight above the recommended level, although without statistical significance (Table 3).

Table 2: Prevalence and Prevalence Ratio of excessive weekly weight gain during pregnancy according to sociodemographic and healthcare factors. Belo Horizonte, MG, Brazil, 2012.

Sociodemographic factors	Total population (n=747) n (%)	Excessive weekly weight gain (n=156)			
		n	%	P value*	PR (95% CI)
Age (years)				0.545	
14 – 19	77 (10,3)	12	15.9		Ref.
20 – 29	351 (47,0)	75	21.4		1.37 (0.74-2.25)
30 – 39	293 (39,2)	65	22.4		1.42 (0.77-2.63)
40 – 55	26 (3,5)	04	15.4		0.99 (0.32-3.06)
Schooling (years of study)				**0.035**	
12 or more	170 (22,8)	26	15.3		Ref.
9 – 11	416 (55,8)	87	20.9		1.37 (0.88-2.12)
0 – 8	160 (21,4)	43	26.9		**1.76 (1.08-2.86)**
Color/race				0.260	
White	214 (28,6)	37	17.3		Ref.
Black/mixed race	507 (67,9)	112	22.1		1.28 (0.88-1.85)
Yellow/Asian/indigenous	26 (3,5)	07	26.9		1.56 (0.69-3.49)
Marital status				0.353	
With partner	567 (75,9)	114	20.1		Ref.
No partner	180 (24,1)	42	23.3		1.16 (0.81-1.65)
Work (paid)				0.841	
No	306 (41,0)	65	21.2		Ref.
Yes	441 (59,0)	91	20.6		0.97 (0.71-1.33)
Household residents (nr. of people)				0.061	
1 – 4	630 (84,3)	124	19.7		Ref.
≥5	117 (15,7)	32	27,3		1.39 (0.94-2.05)
Parity				**0.016**	
Primiparous	53 (13,7)	15	28.3		Ref.
Secundiparous	210 (54,1)	39	18.6		0.66 (0.36-1.19)
Multiparous	125 (32,2)	40	32.0		1.13 (0.62-2.05)
Alcohol consumption				**0.029**	
No	650 (87,3)	128	19.7		Ref.
Yes	95 (12,7)	28	29.5		1.50 (0.99-2.25)
Smoking during pregnancy				0.084	
No	690 (92,4)	139	20.1		Ref.
Yes	57 (7,6)	17	29.8		1.44 (0.86-2.41)
Healthcare factors					
Prenatal care location				**0.002**	
Private	313 (41,9)	50	16.0		Ref.
Public	390 (52,2)	99	25.4		**1.59 (1.13-2.23)**
Both	44 (5,9)	07	15.9		1.00 (0.45-2.20)
Adequate number of antenatal consultations				0.234	
Yes (6 or more)	679 (90,9)	138	20.3		Ref.
No (< 6)	68 (9,1)	18	26.5		1.30 (0.80-2.13)
High risk pregnancy				**<0.0001**	
No	375 (75.6)	69	18.4		Ref.
Yes	121 (24,4)	41	33.9		**1.84 (1.25-2.71)**

*P-value for Pearson's Chi-square test / values in bold - significant (p<0.05); PR - Prevalence ratio.

Table 3: Prevalence and Odds Ratio of reproductive outcomes in the presence of excessive weekly weight gain during pregnancy. Belo Horizonte, MG, Brazil, 2012.

Reproductive outcomes	Excessive weekly weight gain			
	N	%	P value*	OR (95%CI)
Mode of delivery (cesarian section)				
Excessive weight gain			0.067	
No	262	44.3		Ref.
Yes	82	52.6		1.39 (0.98-1.98)
Prematurity				
Excessive weight gain			0.362	
No	64	10.8		Ref.
Yes	13	8.3		0.75 (0.40-1.40)
Low birth weight			0.727	
Excessive weight gain				
No	52	10.6		Ref.
Yes	13	9.6		0.89 (0.47-1.69)
Macrosomia			0.170	
Excessive weight gain				
No	19	3.9		Ref.
Yes	09	6.6		1.76 (0.78-3.99)

*P value for Pearson's chi-square test / OR – Odds Ratio.

DISCUSSION

The results showed the occurrence of overweight at the beginning of pregnancy in one out of every three women, and excessive weight gain in one out of every five pregnant women, especially among those with greater vulnerability. Socioeconomic inequalities, such as low education, parity, unhealthy lifestyle habits, such as alcohol and tobacco consumption, were more prevalent among women who had excessive weight gain during pregnancy. Excessive weight gain was also identified among women with high-risk pregnancies, multiparous, who underwent antenatal care in public services and had fewer than six consultations. In addition, the mean total gain and the mean weekly gain remained within the ranges recommended by the Ministry of Health.

Overweight and obesity among women of childbearing age before becoming pregnant was a prevalent event in this study, corroborating recent findings and an increasing prevalence of these conditions among Brazilian women of reproductive age[13], following global trends, as in the United States[16] and findings for the Brazilian population in all federative units[12]. There is a known relation between this condition and negative repercussions on maternal and fetal health[8,10,17], thereby showing that reproductive planning could reduce these outcomes[18].

The fact that a fifth of the women studied had excessive weight gain reinforces the need for greater attention to guidance on weight gain during prenatal care. Excessive weight gain associated with inadequate nutrition can also have negative impacts on the growth and development of the fetus[16] and on the development of comorbidities in future pregnancies[19].

There is a cultural belief that pregnant women should increase their caloric intake[11], and they are also discouraged from practicing physical activity[20]. Although the increase in caloric intake is a reality, the food ingested should be diversified, ensuring a balanced and quality diet[2]. In addition, light to moderate intensity physical activities contribute to women's health before, during and after pregnancy and to fetal development[20]. The need to develop and intensify preconception, prenatal and puerperal care strategies is emphasized in order to encourage women to adopt healthy lifestyle habits, including diet and regular physical activity practice[3,19,21].

Pregnant women who consumed alcohol and tobacco during pregnancy had higher excessive weight gain, revealing a pattern of accumulation of negative health behaviors, as previously demonstrated[13]. Moderate to frequent intake of alcoholic beverages is also related to increased body and abdominal fat because of the calorie amount provided to the body by each gram of metabolized alcohol[22]. There are many risks of alcohol and tobacco to the fetus, such as physical abnormalities, risk of miscarriage and restricted intrauterine growth[23]. This fact reinforces the need to address healthier lifestyle habits, highlighting the risks of using any quantity of alcoholic beverages and tobacco during pregnancy[23].

Another important result was the association between factors that indicate greater social vulnerability with excessive weight gain. This aspect reveals the presence of health inequities, for example, women with low schooling -

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which may reflect a worse socioeconomic situation - had a greater chance of this outcome. Pregnant women who have less purchasing power consume high calorie content and low nutritional value foods more often, because of their lower cost[1,19]. Other vulnerabilities such as living in households with more than five residents, black/brown race and multiparity should also be considered. These women need that strategies to reduce the impacts of their living conditions on their own health and that of the fetus are incorporated into antenatal care[18]. In relation to multiparity, in each pregnancy there may be an increase of approximately one kilogram in relation to the previous weight and a greater chance of postpartum weight retention[19].

Thus, there seems to be a profile of more socially vulnerable women who are susceptible to excessive weight gain, as they accumulate risk factors. Although associations were not found between all socioeconomic and sociodemographic factors and excessive weight gain, differences in prevalence and gradient have been observed, which could indicate inequity in weight gain. This finding shows to the multidisciplinary healthcare team which groups would benefit the most from health education actions.

Women with high-risk pregnancies had greater weight gain, which brings more severity to their health, even though they underwent high-risk antenatal care. The weight gain of these women could be related to their comorbidities that contribute to weight accumulation[21] or prevent them from practicing physical activity. Therefore, a higher quality of antenatal care must be guaranteed, with early diagnosis of the underlying or acquired disease during pregnancy, and appropriate referral to the high-risk antenatal care[24].

The greater weight gain in pregnant women followed up in the public service and with fewer prenatal consultations may point to a greater vulnerability of these women, as already discussed, reinforcing the importance of the quality of antenatal care. In Brazil, there has been an important expansion of coverage and a consequent increase in access to this healthcare[25]. However, the quality of healthcare also needs to advance, because it is based on hard technologies, such as laboratory exams and ultrasounds[26], neglecting other less technologically dense care types, such as pressure measurement, BMI calculation and completion of charts in the home-based antenatal care record (booklet)[26,27]. Another issue would be the adoption of light technologies, e.g. attentive listening, to dialogue with other technologies and respond to the unique needs of care[28].

Note that nurses are qualified to provide this care by working with strategies of health promotion and disease prevention. The nutritional aspect, as a physiological need, is included in nursing diagnoses and interventions, and nursing interventions include care, teaching and monitoring of the actions developed and/or agreed upon with the woman[29].

The results of this study indicate some care demands in practice. The ideal would be to start with preconception care, through guidance on the importance of losing and controlling weight before pregnancy and encourage the practice of physical activity. In antenatal care, professionals should guide pregnant women towards eliminating the myths related to food and physical activity; advise women and their family about the risks of complications caused by excessive weight gain; monitor and advise on appropriate weight gain; and correctly record the findings in the home-based records and health reports.

This study also showed that excessive weight gain is related to the occurrence of unfavorable reproductive outcomes, such as cesarean sections and macrosomia. Even though this result is not statistically significant, previous studies have demonstrated this relationship with the increasing culture of cesarean sections in the country[30], contributing to prematurity, maternal and child comorbidities and higher maternal and neonatal mortality[31].

Study limitations

A limitation was the impossibility of studying women without records of weight or height, because they presented a greater proportion of social vulnerability characteristics, such as low schooling, black and mixed race, adolescents, multiparous women who drink and smoke, do not work, without a partner and who live with more than five people, according to sensitivity analysis of missing data. This bias could lead to an underestimation of the relationships between the excessive weight gain in women with greater vulnerability, and still points to inequities in antenatal care, since the worst records are among those who would benefit most from surveillance in relation to weight gain, as already demonstrated[13].

On the other hand, a positive aspect of the study was being based on data from an important study related to antenatal care, labor and birth. Although such data refer to the 2011-2012 period, these are underlying data to guide health policies in the obstetric field.

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CONCLUSION

This study showed the occurrence of overweight at the beginning of pregnancy, and excessive weight gain during pregnancy, especially for pregnant women in conditions of greater vulnerability, thereby showing inequities and resulting in unfavorable reproductive outcomes. This fact reinforces the need for greater qualification of healthcare before and during the pregnancy-puerperal period, its association with chronic and noncommunicable diseases, and greater emphasis on the most vulnerable groups.

The continuous increase in obesity in the Brazilian population in the last decade and the fact that excessive weight gain increases the chances of unfavorable obstetric outcomes, reinforce the need to incorporate this approach in antenatal care, given the multiple opportunities at each consultation for guidance on the change of life habits that will benefit the health of both mother and child.

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