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Critical analysis of the calcium intake in pregnant women with high-risk pregnancy

Análise crítica da ingestão de cálcio em gestantes com gravidez de alto risco

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ABSTRACT

Introduction: Preeclampsia is a multifactorial syndrome of pregnancy characterized by increased blood pressure from 20 weeks of gestation, which may or may not be associated with proteinuria or target organ damage. Studies indicate that dietary calcium deficiency acts as an important contributing factor, and adequate calcium intake can reduce the incidence of preeclampsia.

Objective: To determine whether pregnant women seen in outpatient clinics consume the recommended daily amount of calcium, to determine their sociodemographic profile, and to estimate the population at risk.

Method: This observational, cross-sectional, prospective study was conducted by administering a questionnaire on the consumption of calcium-rich foods to estimate the ingested amount in pregnant women seen in an obstetrics outpatient clinic.

Result: A total of 381 pregnant women were included, with a mean age of 29.29 years, and 52 were diagnosed with preeclampsia during pregnancy. Regarding calcium intake, the average was 282.9 mg/day. The average consumption by monthly family income bracket was 219.82 mg in the lowest bracket and 301.86 mg in the highest, but there was no significant difference (p = 0.36) between the average daily calcium intake across salary brackets.

Conclusion: The pregnant women analyzed did not consume the recommended amount of calcium, demonstrating the importance of health education, especially for high-risk pregnant women, as calcium is a nutrient recognized as important in preventing preeclampsia.

KEYWORDS: High-risk pregnancy. Pre-eclampsia. Calcium deficiency.

RESUMO

Introdução: A pré-eclâmpsia é síndrome multifatorial da gravidez caracterizada por aumento da pressão arterial a partir das 20 semanas de gestação, podendo estar associada ou não à proteinúria ou lesão de órgãos-alvo. Estudos apontam que a deficiência de cálcio na dieta atua como importante fator contribuinte, e sua ingestão adequada pode reduzir a incidência de pré-eclâmpsia.

Objetivo: Verificar se gestantes atendidas ambulatorialmente ingerem a quantidade diária recomendada de cálcio, traçar seu perfil sociodemográfico e estimar a população de risco.

Método: Estudo observacional, transversal e prospectivo, realizado por meio da aplicação de questionário sobre consumo de alimentos ricos em cálcio, para estimativa da quantidade ingerida, em gestantes atendidas em ambulatório de obstetrícia.

Resultado: Foram incluídas 381 gestantes, com média de idade de 29,29 anos, e 52 foram diagnosticadas com pré-eclâmpsia durante a gravidez. Em relação à ingestão de cálcio, obteve-se média de 282,9 mg/dia. O consumo médio dele por faixa de renda familiar mensal foi de 219,82 mg na faixa mais baixa e 301,86 mg na mais alta, mas sem diferença significativa (p = 0,36) entre a ingestão média diária de cálcio entre as faixas salariais.

Conclusão: As gestantes analisadas não ingeriam a quantidade recomendada de cálcio, demonstrando a importância da educação em saúde principalmente às gestantes de alto risco, pois o cálcio é nutriente reconhecidamente importante na prevenção da pré-eclâmpsia.

PALAVRAS-CHAVE: Gravidez de alto risco. Pré-eclâmpsia. Deficiência de cálcio.

Central Message

Low calcium intake can cause arterial hypertension by stimulating PTH or renin, increasing the intracellular concentration of the mineral in muscle fibers, causing vasoconstriction. In this way, calcium supplementation alters uteroplacental blood flow, decreasing the resistance of the uterine and umbilical arteries and preventing endothelial damage common in preeclampsia

Perspective

Even though no differences were found in the amount of calcium ingested through the correlation between maternal characteristics, such as socioeconomic level and diagnosis of preeclampsia, calcium supplementation is an effective strategy to reduce its incidence and severity, and it is interesting to think about universal calcium supplementation during pregnancy, as is done with iron. The dissemination of health education to this public, especially high-risk pregnant women, will have a positive impact on what pregnant women understand about preeclampsia and on how they accept and comply with recommendations for its prevention.

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INTRODUCTION

Preeclampsia is a multifactorial syndrome, dependent on inflammatory activity, impacting several systemic components. The diagnosis, made after the 20th week of gestation in a previously normotensive pregnant woman, is made based on the association of arterial hypertension with proteinuria or target organ damage (liver dysfunction, kidney injury, pulmonary edema, among others).[1]

Low calcium intake can cause arterial hypertension by stimulating PTH or renin, increasing the intracellular concentration of the mineral in muscle fibers, causing vasoconstriction. Thus, calcium supplementation alters uteroplacental blood flow, reducing the resistance of the uterine and umbilical arteries and preventing endothelial damage common in preeclampsia (PE).[2]

Thus, it is impossible to dissociate the current scenario of Brazilian food insecurity, in which 55.2% of the population is in some degree of food insecurity - which includes everything from frank hunger to the ingestion of foods low in nutrients - with changes in human rights and high impact on maternal health.[3] The 2008/2009 Household Budget Survey (POF) provided data indicating insufficient calcium intake throughout the country, with even lower consumption by individuals with lower socioeconomic and educational levels.[4]

Thus, the lack of screening for calcium intake during pregnancy, as well as the non-establishment of calcium supplementation for pregnant women with low intake as a public policy for the prevention of PE, corroborates the maintenance of the maternal mortality rate, since PE is the second leading cause of maternal death in Brazil. affecting mainly black women aged 20-29 years, and which may have its aggravation due to inadequate intake.[5]

As a result, there is also an overload of the Unified Health System (SUS), implying greater expenses, since the treatment of this condition requires human, structural and, consequently, financial resources. As pointed out by research, calcium deficiency can generate the occurrence of [144,941] cases of PE per year in Brazil, which means an annual cost of approximately R$ 203,659,371.00.6

The objective of this study was to verify whether pregnant women treated at the Mackenzie Evangelical University Hospital, Curitiba, PR, Brazil, ingest the recommended daily amount of calcium, to trace their sociodemographic profile, and to estimate the population at risk for PE with signs of severity through a previously known protection factor.

METHOD

This is an observational, cross-sectional and prospective study, based on the application of a questionnaire on the intake of calcium-rich foods, to estimate the amount ingested, in pregnant women treated at the hospital's obstetrics outpatient clinic. The inclusion criteria were pregnant women, at any gestational age, aged 16-45 years attending the outpatient clinic. Patients under follow-up for osteoporosis or diseases that alter calcium metabolism were excluded.

The study was approved by the Research Ethics Committee of Faculdade Evangélica Mackenzie do Paraná, Curitiba PR, Brazil, included on Plataforma Brasil under number 58327622.8.0000.0103 and CAAE registered. Because it is prospective, there was a need for the Informed Consent Form (ICF) applied to pregnant women over 18 years of age and the Informed Consent Form (TALE) applied to pregnant women aged 16-17 years.

The research was carried out through a questionnaire on the daily intake of calcium-rich foods, adapted from Coutinho7, which covered the main calcium-rich foods in the diet of the Brazilian population and their amounts ingested during the day. In addition, a sociodemographic questionnaire translated and adapted from Castro and Frías8 was included, which contained full name, date of birth, marital status, education, number of living children, occupation, profession, monthly income, and residential environment. The questionnaires and the ICF/TALE were applied in person by the research participants through the Google Forms platform on the days of operation of the outpatient clinic, with an estimated time of 10 min, and the entire process took place in a private and silent environment, in order to avoid embarrassment.

In addition, the research used a nutritional table that contained the amount of calcium in each food described in the questionnaire adapted from Coutinho7 and completed by the researchers themselves after data collection at the outpatient clinic.

The amount of calcium in each food was calculated according to the data provided by the Brazilian Food Composition Table9, with the amount estimated at 100 g of each product. The following foods were evaluated in the research: whole milk 107.34 mg, skim milk 103.69 mg, semi-skimmed milk 103.69 mg, Minas cheese 1020 mg, mozzarella cheese 774.54 mg, prato cheese 802.19 mg, ricotta cheese 253.34 mg, yogurt 207.04 mg, sour cream 82.73 mg, butter 5.78 mg, sardines 198.21 mg and egg yolk 117.40 mg. The density of some foods such as semi-skimmed milk 1.027 g/mL, whole milk 1.032 g/mL, skim milk 1.035 g/mL, yogurt 1.028 g/mL, and sour cream 0.99 g/mL were also necessary, since the research quantified the intake of pregnant women in milliliters.

The authors' contacts were available at the outpatient clinic and shared in the social groups of the service members. From this, through an active and voluntary search, the participants were able to participate in the study and conduct the interview.

Statistical analysis

The collected data were studied using the ANOVA and Chi-square tests, and p-values below 0.05 were considered statistically significant.

RESULT

Of the universe of 384 responses, 381 met all the inclusion criteria and 3 met at least 1 of them. The sociodemographic profile (Table 1) indicates a mean age of 29.[29±6.41] years, and there was no significant difference when comparing the mean between those who had and did not have a diagnosis of PE, being 29.77 and 29.21 years, respectively.

Regarding self-declared color/ethnicity, 14 (3.67%) were yellow, 196 (51.44%) white, 130 (34.12%) brown, 37 (9.71%) black, and 4 (1.05%) chose not to declare. The predominant marital status was married with 205 answers (53.81%); divorced with 14 (3.67%), single 161 (42.26%) and widowed with 1 answer (0.26%). Regarding education, 19 (4.99%) had incomplete primary education, 28 (7.35%) completed primary school, 38 (9.97%) had completed high school, 189 (49.61%) had completed high school, 47 (12.34%), and 59 (15.49%) had completed higher education, and 1 (0.26%) had no schooling. Regarding the occupation retired, it was n=1 (0.26%), self-employed/liberal professional n=58 (15.22%), unemployed n=39 (10.24%), housewife n=87 (22.83%), employed with a formal contract n=152 (39.90%), employed without a formal contract n=42 (11.02%), pensioner n=2 (0.52%).

The data collected regarding the monthly family income in minimum wages indicated that 25 (6.56%) reported income below 1 (<R$1212.00), 114 (29.92%) between 1 and 1.5 (R$1212.00 - 1818.00), 207 (54.33%) between 2 and 5 (R$2424.00 - 6060.00), 32 (8.40%) between 6 and 10 (R$6060.00 - 12,120.00) and only 3 (0.79%) income above 10 minimum wages (+R$12,120.00).

In addition, the absence of live births was reported by 145 (38.06%), 125 (32.81%), 1 live birth, 74 (19.42%), 2 live births, 26 (6.82%), 3 live births, 8 (2.10%) 4 live births, 2 (0.52%) 5 live births, and 1 (0.26) reported 6 live births. Thus, the average was 1.05±1.09 live births.

Regarding the number of inhabitants per household, the study obtained an average of 3.21±1.20. The last item related to the sociodemographic aspect was related to the area of housing, with 4 (1.05%) reporting living in rural areas and 377 (98.95%) in urban areas.

Regarding the diagnosis of the disease, 52 had PE in the current pregnancy and 329 did not at the time of the interview. In addition, 58 patients (15.22%) reported a diagnosis of PE in a previous pregnancy, 320 (83.99%) denied the presence of this diagnosis, and 3 (0.79%) could not say. When comparing the groups with and without current and previous PE, it was found that 23 (6.04%) of the interviewees had been diagnosed previously and in the current pregnancy, 35 (9.19%) had a previous PE but not in the current pregnancy, 29 (7.61%) did not have PE in a previous pregnancy, but obtained the diagnosis in the current one, 291 (76.38%) had no previous or current diagnosis and 3 (0.79%) did not know if there was a previous diagnosis, but it does not have it in the current pregnancy.

TABLE 1 – Sociodemographic profile of the patients

Average age	29.29 ±6.41)	%
Color/ethnicity		
Yellow	14	3,67
White	196	51,44
Brown	130	34,12
Black	37	9,71
Not declared	4	1,05
Marital status		
Married woman	205	53,81
Divorced	14	3,67
Single	161	42,26
Widow	1	0,26
Schooling		
Incomplete elementary school	19	4,99
Complete elementary school	28	7,35
Incomplete high school	38	9,97
High School	189	49,61
Incomplete higher education	47	12,34
Complete higher education	59	15,49
No schooling	1	0,26
Occupation		
Retired	1	0,26
Self-employed/liberal professional	58	15,22
Unemployed	39	10,24
From home	87	22,83
Maid with a formal contract	152	39,90
Maid without a formal contract	42	11,02
Pensioner	2	0,52
Monthly family income		
<1 minimum wage (<R$1212.00)	25	6,56
1-1.5 minimum wages (R$1212.00 - 1818.00)	114	29,92
2-5 minimum wages (R$2424.00 - 6060.00)	207	54,33
6-10 minimum wages (R$6060.00 - 12,120.00)	32	8,40
+10 minimum wages (+R$12,120.00)	3	0,79
Average number of live births	1.05 (±1.09)	
Average number of people per household	3.21 (±1.2)	
Residence environment		
Rural	4	1,05
Urban	377	98,95

When comparing the ages of pregnant women with and without current PE, the mean age with the current diagnosis was 29.77±6.57 years, while the mean and standard deviation of those without the current diagnosis were 29.21±6.44, respectively, and there was no significant difference between the groups.

Regarding calcium intake, the average was 282.9±255.96 mg/day. When evaluating each food questioned, it was observed that the average daily intake of milk was 171.62 ml (±187), with 279 (73.22%) of the interviewees consuming whole milk, 22 (5.77%) semi-skimmed milk and 15 (3.93%) skim milk and 65 (17.06%) did not ingest any type of milk, with the average daily calcium ingested by the pregnant women in milk being 190 mg.

The daily intake of mozzarella cheese/plate obtained was 15.93 g (±22.8) and the average daily calcium was 0.12 mg (±0.18), and 136 (35.69%) did not eat this type of food. As for Minas cheese/ricotta, an average daily intake of 2.98 g (±11.72) and 0.0221 mg (±0.0871) of calcium was observed on this occasion, but only 58 (15.22%) of the interviewees consumed this type of cheese.

In addition, 161 (42.25%) patients consumed natural

yogurt, with a daily mean of 37.58 ml (±65.7) and a mean daily calcium intake of 80.[23] mg (±140.24). Only 95 (24.93%) used condensed milk, with a mean intake of 2.84 ml/day (±8.4) and the mean daily calcium intake was 9.05 mg (±26.8); 152 (39.89%) of the interviewees reported ingesting heavy cream, with an average daily consumption of 4.04 ml (±7.95) and, consequently, 3.31 mg (±6.51) calcium/day.

Regarding butter, 182 (47.76%) did not use the food, with the average daily consumption of 8.31 g (±12.13) and 0.00048 mg (±0.0007) of calcium for this food. As for sardines, 327 (85.82%) interviewees did not use it in their meals, with an average daily consumption of 5.28 g (±19.12) of the food and an average of 0.02 mg (±0.075) per day; 134 (35.17%) of the pregnant women did not consume boiled egg yolk, and the mean daily intake was 129.25 g (±2310.79) and calcium intake through yolk intake of 0.14 mg (±2.64).

TABLE 2 – Daily calcium intake

Total daily calcium intake (mg)	
Average	282,90
Median	238,58
DP	255,96
n	381,00
mg of calcium ingested by food	
Milk	
Average	190,00
Median	138,37
DP	206,29
Mozzarella cheese/plate	
Average	0,12
Median	0,03
DP	0,18
Minas cheese/ricotta	
Average	0,0221
Median	0,0000
DP	0,0871
Natural yogurt	
Average	80,23
Median	0,00
DP	140,24
Condensed milk	
Average	9,05
Median	0,00
DP	26,80
Heavy cream	
Average	3,31
Median	0,00
DP	6,51
Butter	
Average	0,0004804
Median	0,0001237
DP	0,0007011
Sardine	
Average	0,0208
Median	0,0000
DP	0,0752
Yolk	
Average	0,1479
Median	0,0057
DP	2,6442

DP=standard deviation

When comparing the average daily calcium intake between pregnant women with and without the current diagnosis of PE, no significant difference was found, being 293.9 mg (±261.8) and 281.16 mg (±255.39), respectively, as shown in Table 3A.

TABLE 3 – Comparisons of daily calcium intake between pregnant women with and without a current diagnosis of preeclampsia (A) and daily calcium intake between the monthly family income ranges (B)

A		With PE	Without PE			
	Average	293,90	281,16			
	Median	226,17	239,60			
	DP	261,80	255,39			
	n	52	329			
	p	0,36				
B	SM	<1	1 to 1.5	2 to 5	6 to 10	>10
	Average	219,82	268,19	291,13	329,64	301,86
	Median	166,45	191,62	260,09	278,60	276,80
	DP	212,19	260,11	258,46	262,94	168,61
	n	25	114	207	32	3
	p	0,36				

PE=preeclampsia; SM=minimum wage

Finally, Table 3B shows the mean calcium intake by monthly family income range, with 219.82 mg in the range below 1 minimum wage; 268.19 mg between 1 and 1.5 minimum wages; 291.13 mg between 2 and 5 minimum wages; 329.64 mg between 6 and 10 minimum wages, and 301.86 mg above 10 minimum wages. When applying the ANOVA test with the mean daily calcium intake of the first 4 salary ranges, there was no significant difference (p = 0.36).

DISCUSSION

The present study found that the mean calcium intake of the pregnant women interviewed was lower than recommended,[2] establishing an association with risk factors for preeclampsia. This research evaluated the epidemiology, the sociodemographic context of the interviewees, ethnicity, marital status, education, occupation, number of live births, in addition to the factors listed as risk for the development of PE, such as diagnosis of the disease in previous and/or current pregnancy and calcium intake profile.[10]

The literature shows that a diet with low calcium intake correlates with an increase in the incidence of PE, justifying the supplementation of this nutrient throughout prenatal care.[10] A review of 12 studies, published in Cochrane in 2010, showed that dietary calcium supplementation reduced the risk of pregnant women developing both PE and hypertension, with an even more considerable reduction when high-risk pregnant women with deficient calcium intake were observed, which was the predominant situation in the present study.[11]

Among the risk factors, advanced maternal age (over 40 years) is of considerable importance because it favors gestational complications, including PE. In this study, the mean age of the women was 29.29 years, and most of the interviewees were below the age range at risk, following a result mostly seen in other studies on the disease and reinforcing the intermediate character in terms of the importance of evidence of this risk factor.[12]

With regard to self-declared ethnicity, although the

majority considered themselves white (51.44%), the risk of black women developing hypertensive diseases during pregnancy is slightly higher.[13] In the meantime, it is necessary to point out that, although only 1% of the participants are black, this minority has greater difficulty in accessing public health in Brazil and suffers from health problems resulting from unfavorable socioeconomic conditions. In line with this aspect, a 2018 study found that black or brown women, when compared to white women, have access to fewer prenatal consultations.[14] In addition, the same study pointed out that the darker the skin color of the pregnant woman, the greater the chance of low level of education and the later the start of prenatal care, which limits the patient's understanding of the disease, compromising the prevention and treatment of PE.[14]

Regarding the marital status of the interviewees, although most declared themselves married/in a stable union, another large group declared themselves single (42.26%). The literature shows that adherence to the minimum number of prenatal consultations is higher in the group of married or legally separated women.[15] Therefore, from this, it can be inferred that single pregnant women form a vulnerable group, in many cases without the necessary emotional and financial support, making the process of pregnancy even more regretful.[16] Regarding the impact of the level of education, it is known that the low level of education is directly associated with the increase in complications during the gestational period, since pregnant women belonging to this group are less educated about the indispensability of well-done prenatal care to reduce complications in the maternal-fetal binomial.[16] Although the study was conducted in a high-risk outpatient clinic of the SUS, most of the interviewees had at least completed high school, and theoretically did not have the level of education as a limiting factor for access to information and habits necessary for a healthier pregnancy.

Still, with regard to the sociodemographic profile, the fact that approximately half of the sample is composed of employed women with or without a formal contract, brings some relief when analyzing the possibility of financial independence. However, more than 30% of the interviewees stated that the monthly family income did not exceed 1.5 minimum wages, which was insufficient to maintain a house in an urban area with about 4 residents (average profile of the interviewees) in dignified and healthy housing conditions. In the meantime, it is known that the lower the patient's purchasing power, the lower the possibility of a diet rich in essential nutrients, such as calcium-containing foods, due to the high market value.[16] A 2015 study by Borges et al.[17] indicated that, when trying to follow the diet recommended in the "Food Guide for the Brazilian Population", there would be a daily cost of R$3.47, compromising a considerable portion of the family income at the end of the month.

Thus, when imagining an unfortunate progression of this scenario in the last decade, the difficulty in maintaining an adequate diet is indisputable, in addition to all the costs in the process of living (or surviving, in some cases) on about R$2,000.00 per month - a reality of most of the sample studied. Therefore, when analyzing the foods (eggs, fish, dairy products) that have calcium in their composition and that would bring benefits to the pregnant woman in the prevention of PE, it is noted that these are in the background, being purchased only if there is a "positive balance" at the end of the month, while the priority becomes the monthly responsibilities (water, energy, rent) and industrialized foods with few nutrients, however, more accessible.[16]

Regarding the diagnosis of PE, only 13.65% of the pregnant women had already been diagnosed at the time of the interview, and it is important to highlight that the gestational age was heterogeneous and, therefore, it should be considered that some of them were still less than 20 weeks pregnant, and it is not possible to confirm the presence or absence of PE. Regarding recurrence, 15.22% of the sample reported 1 previous episode of the condition and, although the literature states a chance of recurrence of around 15% in cases diagnosed with PE in previous pregnancies, many articles still associate the disease with primiparous, since the bad experience during pregnancy influences the choice to avoid the next one.[10,14] In the present study, 6% of the interviewees were diagnosed with PE in the previous and current pregnancies, in accordance with what has been found in the literature. Also, it is known that women who had PE in the first 2 pregnancies, approximately 30% will have the disease in a next pregnancy.[13] This risk is even greater if the previous PE had an early onset, had associated severity factors, or progressed to eclampsia or HELLP syndrome.

Regarding calcium intake, it was found that the daily average was 289.[2] mg - well below the amount considered adequate by the Estimated Average Requirement for adult pregnant women (800 mg/day).[2] In the present study, when talking to the interviewees, it was noted that they did not have the ideal intake due to a series of factors, but mainly due to the difficulty of buying foods rich in this micronutrient. According to data from the Brazilian Institute of Geography and Statistics (IBGE), dairy products are the food source with the highest bioavailability of calcium, according to this, the food with the highest calcium content (190 mg/day) ingested by the interviewees was milk.[7] However, this amount of calcium is still lower than that found in 200 ml of the drink (300 mg), proving insufficient intake. In addition, the most ingested type was whole milk (73.22%), suggesting that the pregnant women were not instructed that this is not the best choice in terms of calcium content and low fat percentage, as skimmed or semi-skimmed milk would be healthier and more beneficial options.[7]

Another dairy product addressed in the research was cheese (mozzarella, prato, minas and ricotta). As for the first 2, more than 60% of the patients ingested them, with a daily average of 15.93 g (less than 1 slice) - a better result than that presented in the study by Coutinho[7]. However, the minas and ricotta types, which have a higher calcium content, were consumed by less than 16%, bringing to light, once again, the socioeconomic influence, since these products are more expensive and

seen as superfluous in food. In addition, natural yogurt was also present in the diet of almost half of the sample (42.25%), with an average daily amount of calcium of 80.23 mg - lower than that found in 200 ml of the product and below the daily portion recommended by the Ministry of Health.[18] The proportion of interviewees who consumed yogurt was similar to that found in the study by Coutinho[7], however, emphasizing that it was carried out 10 years ago, alerting us that there has been no considerable progress in the acceptance of the recommendations for dairy intake.

Regarding the consumption of condensed milk, less than 1/4 of the pregnant women approached reported consumption. This data is consistent with the reality of the high-risk outpatient clinic in which the study was applied, since most patients are referred due to previous diabetes or gestational diabetes and are advised by health professionals to drastically reduce the consumption of foods rich in carbohydrates and sugars. Thus, this data enables the discussion about this important risk factor for PE. The Hyperglycemia and Adverse Pregnancy Outcomes - HAPO study, which involved about 25,000 pregnant women in several countries, highlighted the positive and linear correlation between altered blood glucose values and the higher occurrence of unfavorable maternal-fetal outcomes, including PE.[19] With regard to the consumption of heavy cream, although approximately 40% of the interviewees ingest it, the average amount of daily calcium (3.31 mg) is small compared to what is necessary, and this low consumption can be justified by the same factor presented in the previous topic.

Regarding the intake of butter, sardines and egg yolks, most of the pregnant women did not consume them: 47.7%, 85.82% and 35.17%, respectively. When questioned about the reasons for the absence from the food menu, the answers ranged from association with episodes of nausea to the financial difficulty in buying such foods in order to eat them with adequate frequency. About butter, another point in common among the pregnant women interviewed is that many consumed margarine: according to data from the United States Department of Agriculture (USDA), 100 g of the product contains 3 mg of calcium, while the same amount of butter has 8 times more calcium.[20] In addition, despite its lower cost, margarine has a higher amount of trans fats in its composition, favoring an increased risk of other health complications, such as dyslipidemia and obesity. Although some of the interviewees included butter, sardines, and egg yolks in their diets, the amounts ingested were small, resulting in an average daily calcium intake of 0.00048 mg, 0.02 mg, and 0.14 mg, respectively.

This scenario of deficiency in calcium consumption is not exclusive to Brazil and, therefore, the World Health Organization (WHO) recommended in the document "Prenatal Care for a positive experience in pregnancy", from 2017, calcium supplementation in regions with low intake. In this context, the recent Cochrane study (2018) showed that supplementation, from the 20th week of gestation, reduced the risk of PE by 64% in populations with a low-calcium diet, such as in Brazil.[2] For pregnant women at high risk for PE, supplementation should start even earlier, from the 12th week.[10] Thus, it has been proven that with a low cost for the SUS (about R$0.10 per unit) and easy adherence to use, calcium carbonate replacement (1 g/day) becomes the main route of intervention to prevent PE, in addition to other fetal conditions, such as prematurity and fetal malformations. When comparing the annual cost of supplementation for pregnant women with that of the treatment of complications generated by PE (more than 200 million), it is evident that, once again, prevention is the best choice.[6]

Regarding the comparison of the mean calcium intake between pregnant women with and without a diagnosis of PE at the time of the interview, no significant difference was found (293.9 mg and 281.16 mg, respectively). This information corroborates the hypothesis that, even with the diagnosis of the disease, pregnant women do not receive or do not follow guidance to improve calcium intake, proving how challenging it is to propose dietary changes. Furthermore, it can be noted that both groups are ingesting only 1/3 of the recommended daily amount of calcium and 1/2 of the average Brazilian consumption, making supplementation with calcium carbonate even more essential to prevent not only PE, but also other consequences of hypertensive diseases during pregnancy.[2,10,21] In addition, when comparing the amount of calcium ingested according to the salary range, the present study showed that the higher the income, the higher the average daily consumption of the nutrient, reiterating the influence of the financial factor. However, the low intake cannot be justified only in this association, since other poorer populations, such as Guatemala and Ethiopia, have diets that are poor in calories and proteins, but rich in calcium.[21]

CONCLUSION

The present study demonstrates that the pregnant women submitted to the study did not ingest the recommended amount of calcium, as initially expected. In addition, it was also able to trace the sociodemographic profile of the patients, associating these data with difficulties in understanding the disease and adherence to behavioral changes, including dieting, to establish a protective factor during pregnancy. Since no differences were found in the amount of calcium ingested through the correlation between maternal characteristics such as socioeconomic level and diagnosis of preeclampsia, even though calcium supplementation is an effective strategy to reduce the incidence and severity of the disease, it is interesting to think about universal calcium supplementation during pregnancy, as is done with iron. Continuity in studies and dissemination of health education for this public, especially in places of care that receive mostly high-risk pregnant women, will have a positive impact on what pregnant women understand about preeclampsia and on the way they accept and comply with recommendations for its prevention.

Authors' contributions

Mariana de Souza Bissoli - Conceptualization
Nathalia Arndt Costa - Formal analysis
Viviane Dombroski - Research
Naiara Bozza Pegoraro - Methodology
Arthur Rodrigues Caetano de Sousa - Validation
Jan Pawel Andrade Pachnicki - Project Management

REFERENCES

1. Peraçoli JC, Costa ML, Cavalli RC, Oliveira LG, Korkes HA, Ramos JGL, et al. Pré-eclâmpsia – Protocolo 2023. Rede Brasileira de Estudos sobre Hipertensão na Gravidez (RBEHG); 2023.
2. Kappes S. Consumo alimentar de cálcio em gestantes hipertensas e a sua associação com fatores de risco para a pré-eclâmpsia [tese]. Chapecó: Faculdade de Enfermagem, Universidade Federal da Fronteira Sul; 2019. Disponível em: https://rd.uffs.edu.br/bitstream/prefix/4852/1/KAPPES.pdf
3. Grupo da Sociedade Civil para a Agenda 2030. V Relatório Luz da Sociedade Civil – Agenda 2030 de Desenvolvimento Sustentável. Brasil; 2021. Disponível em: https://brasilnaagenda2030.files.wordpress.com/2021/07/por_rl_2021_completo_vs_03_lowres.pdf
4. França NAG, Martini LA. Cálcio: funções plenamente reconhecidas de nutrientes. International Life Sciences Institute do Brasil; 2018. Disponível em: https://ilsibrasil.org/wp-content/uploads/sites/9/2018/10/Fasc%C3%ADculo-C%C3%81LCIO-ok-autora.pdf
5. Gomes TB, Silva LI, Mangueira NP, Silva CS, Paiva MTG, Lira VM, et al. Pré-eclâmpsia: importante causa de óbitos maternos no Brasil entre os anos de 2010-2017. Braz J Dev. 2020;6(10):75496-510. http://doi.org/10.34117/bjdv6n10-107
6. Del Aguila M, Tavares AB, Arinelli R, Pereira ACPR, Pepe C. Análise do impacto econômico da falta de suplementação multivitamínica em mulheres em idade reprodutiva e suas consequências em recém-nascidos. J Bras Econ Saúde. 2020; 12(2): 135-41. http://doi.org/10.21115/JBES.v12.n2.p135-41
7. Coutinho SMB. Avaliação da ingestão alimentar e a suplementação de cálcio em mulheres no climatério e pós-menopausa [dissertação]. Porto Alegre: Pontifícia Universidade Católica do Rio Grande do Sul; 2013. Disponível em: https://tede2.pucrs.br/tede2/handle/tede/2702
8. Castro R, Frías SM. Obstetric violence in Mexico: results from a 2016 national household survey. Violence Against Women. 2019;25(9):1078-96. https://doi.org/10.1177/1077801219836732
9. Tabela Brasileira de Composição de Alimentos – TBCA. São Paulo: FCF/USP; 2021. Disponível em: https://tbca.net.br/index.html
10. Federação Brasileira das Associações de Ginecologia e Obstetrícia (FEBRASGO). Pré-eclâmpsia nos seus diversos aspectos. Série Orientações e Recomendações FEBRASGO. 2017;8. Disponível em: https://www.febrasgo.org.br/media/k2/attachments/12-PRE_ECLAyMPSIA.pdf
11. Hofmeyr GJ, Atallah AN, Duley L. Calcium supplementation during pregnancy for preventing hypertensive disorders and related problems. Cochrane Database Syst Rev. 2006;(3):CD001059. http://doi.org/10.1002/14651858.CD001059.pub2
12. Ferreira ETM, Moura NS, Gomes MLS, Silva EG, Guerreiro MGS, Oriá MOB. Maternal characteristics and risk factors for preeclampsia in pregnant women. Rev Rene. 2019;20:e40327. http://doi.org/10.15253/2175-6783.20192040327
13. Amaral WT, Peraçoli JC. Fatores de risco relacionados à pré-eclâmpsia. Comun Ciênc Saúde. 2011;22(Supl 1):S161-8. Disponível em: https://bvsms.saude.gov.br/bvs/artigos/fatores_risco_relacionados.pdf
14. Carmo CB, Melo LC, Silva TF, Souza EM, Garcia CM. Desafios do processo gestacional de mulheres negras: uma revisão narrativa. Femina. 2021;49(12):690-8. Disponível em: https://docs.bvsalud.org/biblioref/2022/02/1358206/femina-2021-4912-690-698.pdf
15. Fonseca LS, Carvalho BC, Santos JCO, Ferreira LLL, Lima ACR. Panorama nacional da adesão ao pré-natal: série histórica de 2009 a 2018. J Nurs Health. 2022; 12(1):e2212120433. https://doi.org/10.15210/jonah.v12i1.2245
16. De Oliveira CMDD, de Lima JL, de Freitas KO, de Vasconcelos LMA, Costa P, Figueiredo SN, et al. Perfil de mulheres grávidas com evolução para pré-eclâmpsia no município do Amazonas: uma pesquisa documental. Braz J Dev. 2023;9(1):2590-607. https://doi.org/10.34117/bjdv9n1-179
17. Borges CA, Claro RM, Martins APB, Villar BS. Quanto custa para as famílias de baixa renda obterem uma dieta saudável no Brasil? Cad Saúde Pública. 2015;31(1):137-48. https://doi.org/10.1590/0102-311X00005114
18. Universidade Federal do Rio Grande do Sul. Telessaúde RS (Telessaúde RS-UFRGS). TeleCondutas: doenças hipertensivas na gestação: versão digital. Porto Alegre: UFRGS; 2023. Disponível em: https://www.ufrgs.br/telessauders/wp-content/uploads/2023/01/telecondutas_doencas_hipertensivas_gestacao.pdf
19. Metzger BE, Lowe LP, Dyer AR, Trimble ER, Chaovarindr U, Coustan DR, et al. Hyperglycemia and adverse pregnancy outcomes. N Engl J Med. 2008;358(19):1991-2002. 10.1056/NEJMoa0707943
20. U.S. Department of Agriculture, Agricultural Research Service, Beltsville Human Nutrition Research Center. FoodData Central. 2020. Disponível em: https://fdc.nal.usda.gov/
21. Silva ACAA. A suplementação de cálcio na prevenção da pré-eclâmpsia: revisão de literatura [tese]. São Paulo: Programa de Residência Médica de Ginecologia e Obstetrícia do Hospital do Servidor Público Municipal; 2022. Disponível em: https://docs.bvsalud.org/biblioref/2023/02/1413495/tcc-ana-carolina-silva.pdf