

Analysis of calcium prescription in prenatal care for pregnant women in the Unified Health System of Cascavel, Paraná

Análise da prescrição de cálcio no pré-natal de gestantes no sistema único de saúde de Cascavel, Paraná

Análisis de la prescripción de calcio en el control prenatal de gestantes en el Sistema Único de Salud de Cascavel, Paraná

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REVISA

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RESUMO

A pré-eclâmpsia representa um problema de saúde pública devido às suas complicações graves, incluindo a morte materna. Nesse contexto, a suplementação de cálcio é relevante por sua associação com a redução da incidência de pré-eclâmpsia. Este estudo analisou a prescrição de cálcio no pré-natal de gestantes atendidas pelo Sistema Único de Saúde (SUS) em Cascavel, Paraná, através de um estudo observacional analítico transversal com dados coletados de 92 questionários respondidos por gestantes. Observou-se uma associação significativa entre antecedentes familiares de pressão alta e a orientação médica sobre o consumo de cálcio. Uma análise de regressão logística binária mostrou que ter antecedentes familiares de pressão alta aumentou significativamente a chance de receber essa orientação. A análise revela uma lacuna significativa entre as práticas atuais e as recomendações da Organização Mundial da Saúde para suplementação de cálcio na gravidez. O cálcio é crucial nesse contexto, e a suplementação adequada pode reduzir a incidência e a gravidade da pré-eclâmpsia. Assim, é essencial melhorar a orientação clínica, promover a conscientização sobre o pré-natal e dietas ricas em cálcio, e realizar investigações mais abrangentes para implementar estratégias eficazes de suplementação de cálcio.

Descritores: Cálcio na dieta; Nutrição da gestante; Pré-eclâmpsia.

ABSTRACT

Preeclampsia represents a public health problem due to its severe complications, including maternal death. In this context, calcium supplementation is relevant for its association with reducing the incidence of preeclampsia. This study analyzed calcium prescription in prenatal care for pregnant women treated by the Unified Health System (SUS) in Cascavel, Paraná, through an observational cross-sectional analytical study with data collected from 92 questionnaires completed by pregnant women. A significant association was observed between a family history of high blood pressure and medical guidance on calcium consumption. A binary logistic regression analysis showed that having a family history of high blood pressure significantly increased the likelihood of receiving this guidance. The analysis reveals a significant gap between current practices and the World Health Organization's recommendations for calcium supplementation during pregnancy. Calcium is crucial in this context, and adequate supplementation can reduce the incidence and severity of preeclampsia. Therefore, it is essential to improve clinical guidance, promote awareness of prenatal care and calcium-rich diets, and conduct more comprehensive investigations to implement effective calcium supplementation strategies.

Descriptors: Dietary calcium; Maternal nutrition; Preeclampsia.

RESUMEN

La preeclampsia representa un problema de salud pública debido a sus complicaciones graves, incluida la muerte materna. En este contexto, la suplementación con calcio es relevante por su asociación con la reducción de la incidencia de la preeclampsia. Este estudio analizó la prescripción de calcio en la atención prenatal de gestantes atendidas por el Sistema Único de Salud (SUS) en Cascavel, Paraná, mediante un estudio observacional analítico de corte transversal con datos recolectados a partir de 92 cuestionarios respondidos por gestantes. Se observó una asociación significativa entre antecedentes familiares de hipertensión arterial y la orientación médica sobre el consumo de calcio. El análisis de regresión logística binaria mostró que tener antecedentes familiares de hipertensión aumentó significativamente la probabilidad de recibir dicha orientación. El análisis revela una brecha importante entre las prácticas actuales y las recomendaciones de la Organización Mundial de la Salud sobre la suplementación con calcio durante el embarazo. El calcio es fundamental en este contexto, y una suplementación adecuada puede reducir la incidencia y la gravedad de la preeclampsia. Por lo tanto, es esencial mejorar la orientación clínica, promover la concienciación sobre la atención prenatal y las dietas ricas en calcio, así como realizar investigaciones más amplias para implementar estrategias efectivas de suplementación con calcio.

Descriptores: Descriptores: Calcio dietético; Nutrición materna; Preeclampsia.

ORIGINAL

Introduction

Calcium supplementation during pregnancy is crucial for maternal and fetal health, helping reduce the risk of preeclampsia, especially in predisposed women and those with low calcium intake.¹ Although its benefits are recognized, calcium consumption among pregnant women in Brazil remains below daily recommendations, with only 50% of the recommended 1,000 milligrams.² This deficiency is significant, as calcium plays a key role in preventing the metabolic and hemodynamic imbalances of preeclampsia.³ Adequate supplementation may reduce the incidence and severity of the condition and its complications.²

Preeclampsia represents one of the leading causes of maternal morbidity and mortality worldwide.⁴ The complexity of its pathological mechanisms involves maternal immune system dysfunction and impaired uterine perfusion, culminating in a series of complications that can affect both mother and fetus.⁵ From eclampsia to placental abruption and renal failure, the impacts of preeclampsia can be devastating if not identified early and treated properly.⁶

Thus, it is imperative not only to recognize risk factors for preeclampsia development—such as family history of the condition, hypertension, gestational diabetes, twin pregnancy, Black race, and obesity—but also to promote effective intervention strategies.⁷ The WHO's recommendation for calcium supplementation in pregnant women with low intake is an important preventive measure that should be widely adopted.⁸ In the context of Brazil's Unified Health System (SUS), understanding calcium prescription in prenatal care can provide relevant information on the effectiveness of current practices and identify areas that require improvement to ensure optimal maternal and fetal health.

This study aims to determine the prevalence of calcium supplementation prescriptions during prenatal care among pregnant women seen by the SUS in Cascavel, Paraná (PR). Specific objectives include analyzing whether calcium is prescribed more frequently to pregnant women at risk of preeclampsia; assessing pregnant women's knowledge about the importance of calcium during pregnancy; and discussing the scientific evidence on calcium's contribution to preventing preeclampsia and its benefits for maternal and fetal health. These objectives seek to understand calcium prescription practices in prenatal care and assess pregnant women's awareness of its importance.

Method

This is an analytical cross-sectional study, with data collected through a 19-item questionnaire administered to pregnant women receiving prenatal care from the Unified Health System in Cascavel-PR, aimed at evaluating the prevalence of calcium prescriptions. The participating health units serve pregnant women in general, not restricted to those at high obstetric or clinical risk.

This study enrolled 92 pregnant women waiting for care; interviews were conducted from February to April 2024. All participants signed the Informed Consent Form (ICF) after receiving full explanations. Inclusion criteria were: any gestational age, more than one prior prenatal visit, age ≥ 18 years, ability to understand and answer the questions, and receiving prenatal care in Health District 1 of the Unified Health System in Cascavel-PR. Excluded were pregnant women at their first prenatal visit, those under 18 years of age, anyone unable to understand or respond to the

questions, those who did not sign the ICF, and women not receiving care in Health District 1 of Cascavel.

Data were entered into an Excel 2010 spreadsheet and analyzed statistically. Categorical variables are presented as absolute and relative frequencies, continuous variables are described by median and interquartile range. Associations between categorical variables were tested with the chi-square test, switching to Fisher's exact test when expected counts were < 5 .⁹ Effect size was assessed with the Phi coefficient for 2×2 tables and Cramer's V for larger tables. Interpretation thresholds were defined as small (0.10–0.29), moderate (0.30–0.49), and large (≥ 0.50).¹⁰ Logistic regression analyses were performed to examine the impact of variables on the likelihood of guidance toward calcium-rich foods. All analyses were conducted using Jamovi software version 2.4.14.

The study complied with Brazilian ethical guidelines for research involving human subjects (National Health Council Resolution 466/12) and was approved by the Research Ethics Committee (REC) of the Assis Gurgacz University Center Medical School under protocol 6.424.130.

Results

Table 1 shows that the median age of the sample was 28.50 years (IQR: 23.75–32.00 years). The median gestational age was 23.50 weeks (IQR: 14.75–31.00 weeks). Results for the remaining variables are presented in the table below.

Table 1 – Descriptive analysis of demographic and pregnancy-related variables

Variable	N = 92
Age:	28,50 (23,75, 32,00)
How many weeks pregnant are you?	23,50 (14,75, 31,00)
When did you start prenatal care?	6,00 (4,00, 10,75)
How many prenatal visits have you had?	3,00 (2,00, 6,00)
Is this a twin pregnancy?	
No	89,00 (96,74%)
Yes	3,00 (3,26%)
Is this your first pregnancy?	
No	38,00 (41,30%)
Yes	54,00 (58,70%)
If NO, how many times have you been pregnant?	
1	18,00 (47,37%)
2	11,00 (28,95%)
3	9,00 (23,68%)
Do you smoke?	
No	90,00 (97,83%)
Yes	2,00 (2,17%)
Do you have high blood pressure?	
No	83,00 (90,22%)
Yes	9,00 (9,78%)
If YES, hypertension diagnosed:	
Before pregnancy	3,00 (33,33%)

After pregnancy	6,00 (66,67%)
Do you have diabetes?	
No	76,00 (82,61%)
Yes	16,00 (17,39%)
If YES, diabetes diagnosed:	
Before pregnancy	7,00 (43,75%)
After pregnancy	8,00 (50,00%)
I prefer not to say	1,00 (6,25%)
Do you have any autoimmune disease?	
No	90,00 (97,83%)
Yes	2,00 (2,17%)
If YES, which disease?	
Psoriasis	1,00 (50,00%)
Vitiligo	1,00 (50,00%)
Do you have any kidney disease?	
No	83,00 (90,22%)
Yes	9,00 (9,78%)
If YES, kidney disease diagnosed:	
Before pregnancy	8,00 (88,89%)
After pregnancy	1,00 (11,11%)
Do you have a family history of high blood pressure?	
No	40,00 (43,48%)
Yes	52,00 (56,52%)
Do you have a family history of pre-eclampsia?	
No	77,00 (83,70%)
Yes	15,00 (16,30%)
Do you have a family history of eclampsia (preeclampsia + seizures)?	
No	87,00 (94,57%)
Yes	5,00 (5,43%)
Did your doctor advise you to eat calcium-rich foods?	
No	42,00 (45,65%)
Sim	50,00 (54,35%)
If YES, do you follow the recommended diet?	
No	5,00 (10,00%)
Yes	45,00 (90,00%)
How many glasses of milk do you drink on average per day?	
0	10,00 (10,87%)
0,5	4,00 (4,35%)
1	36,00 (39,13%)
2	33,00 (35,87%)
3	8,00 (8,70%)
4	1,00 (1,09%)
Has your doctor prescribed calcium supplementation?	

No	82,00 (89,13%)
Yes	10,00 (10,87%)
If YES, were you informed about the reason for the prescription?	
No	6,00 (60,00%)
Yes	4,00 (40,00%)
If you were informed, for what reason was the calcium prescribed?	
Low intake	3,00 (75,00%)
To support the baby's development	1,00 (25,00%)
Do you take calcium in tablet form?	
No	85,00 (92,39%)
Yes	7,00 (7,61%)
If yes, when did you start taking it?	
13 weeks of pregnancy	1,00 (16,67%)
16 weeks of pregnancy	1,00 (16,67%)
21 weeks of pregnancy	1,00 (16,67%)
22 weeks of pregnancy	1,00 (16,67%)
3 weeks of pregnancy	1,00 (16,67%)
5 weeks of pregnancy	1,00 (16,67%)

n (%); Median (*interquartile range*; IQR).

Table 2 shows a significant association with small effect size between both 'Do you have high blood pressure?' and 'Do you have kidney disease?' and the outcome variable 'Did your doctor advise you to consume calcium-rich foods?'. A significant moderate association was found between 'Do you have a family history of pre-eclampsia?' and the same outcome. Finally, there was a significant strong association between 'Do you have a family history of high blood pressure?' and receiving advice to consume calcium-rich foods. with "Has your doctor advised you to consume calcium-rich foods?" These results suggest that these variables may be factors to consider when advising calcium-rich food consumption.

Table 2 – Association analysis between variables of interest and calcium-rich food consumption guidance

Variables	Categories	Did your doctor advise you to consume foods rich in calcium?		p	TDE
		No	Yes		
Do you smoke?	No	42 46,67 %	48 53,33 %	0,498	0,137
	Yes	0 0,00 %	2 100,00 %		
Do you have high blood pressure?	No	41 49,40 %	42 50,60 %	0,036	0,228
	Yes	1 11,11 %	8 88,89 %		
Do you have diabetes?	No	38 50,00 %	38 50,00 %	0,068*	0,190

Do you have any autoimmune disease?	Yes	4 25,00 %	12 75,00 %	0,498	0,137
	No	42 46,67 %	48 53,33 %		
Do you have any kidney disease?	Yes	0 0,00 %	2 100,00 %	0,036	0,228
	No	41 49,40 %	42 50,60 %		
Do you have a family history of hypertension?	Yes	1 11,11 %	8 88,89 %	< ,001*	0,560
	No	31 77,50 %	9 22,50 %		
Do you have a family history of preeclampsia?	Yes	11 21,15 %	41 78,85 %	< ,001*	0,345
	No	41 53,25 %	36 46,75 %		
Do you have a family history of eclampsia (preeclampsia with seizures)?	Yes	1 20,00 %	4 80,00 %	0,371	0,124
	No	41 47,13 %	46 52,87 %		

Fisher's Exact Test; ES: effect size (*Cramer's V*). *Pearson's chi-square. Bold results indicate significant association.

In Table 3, using the variables that were significant in the association analyses, a simple binary logistic regression was conducted to understand their impact on the outcome variable ("Has your doctor advised you to consume calcium-rich foods?"). The model was statistically significant [$\chi^2(4) = 36.608$, $p < 0.001$], correctly predicting 86 % of positive cases. The explained variance of the model was r^2 (Nagelkerke) = 0.439.

According to the results, only the variable "Do you have a family history of high blood pressure?" was significant; thus, the odds of a person who answered "Yes" to this variable receiving advice to consume calcium-rich foods are 8.92 times higher than for those who do not have a family history.

Table 3 –Results of the Binary Logistic Regression Analysis

Predictors	B	Standard error	Z	p	Odds ratio
Intercept	-1,35	0,40	-3,41	< ,001	0,26
Do you have high blood pressure?					
Yes – No	1,76	1,26	1,40	0,162	5,83
Do you have any kidney disease?					
Yes – No	0,80	1,14	0,70	0,484	2,23

Do you have a family history of high blood pressure?					
Yes - No	2,19	0,56	3,94	<,001	8,92
Do you have a family history of preeclampsia?					
Yes - No	1,29	1,12	1,15	0,250	3,63

Source: Authors, 2025.

Discussion

Statistical analysis revealed that only a small percentage of pregnant women received prescriptions for calcium supplementation during pregnancy, highlighting a significant gap between current practices and WHO recommendations for pregnant women with low calcium intake.⁸ This is relevant, as low calcium intake during pregnancy can increase the risk of preeclampsia.¹

Preeclampsia is characterized by multisystem disorders, including arterial hypertension, elevated hepatic transaminases, proteinuria and hypocalciuria, seizures (eclampsia), and severe complications such as placental abruption, renal failure, pulmonary edema, and maternal and fetal death.^{11,12} The pathophysiology of preeclampsia involves dysfunction of the maternal immune system, which prevents adequate trophoblastic invasion and remodeling of the spiral arteries, resulting in placental ischemia and release of toxic factors that exacerbate maternal inflammation and endothelial dysfunction.¹¹

Calcium plays a crucial role in preventing preeclampsia, as the hypocalciuria observed in the condition is associated with decreased calcium intake or intestinal absorption, leading to increased parathyroid hormone and arterial vasoconstriction.³ Adequate calcium supplementation can modulate these mechanisms, reducing both the incidence and severity of pre-eclampsia and its complications.¹³

In addition, the mother's nutritional status during pregnancy has epigenetic implications for fetal development, influencing factors such as insulin resistance and intestinal dysbiosis. Studies indicate that an imbalance in maternal calcium intake can affect body-weight gain in offspring by modulating gut microbiota and lipid metabolism.¹⁴

Beyond systematic supplementation, it is essential to promote consumption of calcium-rich foods and to raise awareness among women and their birth companions about the importance of starting antenatal care early and attending at least eight prenatal visits. Companion involvement should be encouraged to improve adherence to supplementation, using personal invitations, mass communication, or home visits.¹⁵

Thus, the statistical findings and the literature underscore the importance of a personalized approach to antenatal care that considers each pregnant woman's specific risk factors to safeguard maternal and fetal health. Nevertheless, certain limitations of this study must be acknowledged, such as sample size and its cross-sectional design, which restrict the ability to establish causal relationships. Moreover, data were collected in a single geographic region, which may limit the generalizability of the results to other populations. Despite these limitations, calcium supplementation stands out as an essential preventive strategy for reducing risks associated with pre-eclampsia.

Conclusion

Given the importance of calcium in preventing pre-eclampsia and its complications, it is essential to improve guidance and clinical practice related to supplementation during pregnancy. Moreover, it is crucial to strengthen awareness of early prenatal care and the promotion of a calcium-rich diet for both pregnant women and their partners. Future investigations with larger and more diverse samples, together with longitudinal designs, can provide a fuller understanding of the factors that influence calcium supplementation during pregnancy in this context. Thus, calcium supplementation emerges as an essential strategy for reducing the risks associated with pre-eclampsia, underscoring the urgency of effective interventions to bridge the gap between theory and clinical practice.

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