



The Effect of Giving Calcium Supplementation Since the First Trimester on Preventing Preeclampsia in Pregnant Women at the Dulupi Public Health Center

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Abstract. A crucial and beneficial step in avoiding the development of hypertensive illnesses during pregnancy is to provide calcium supplementation. To lower the risk of pregnancy problems, special consideration should be given to the degree to which expectant mothers are knowledgeable about and adhere to the use of calcium supplements. Utilizing a quantitative methodology and correlational analytical design, this study seeks to examine the impact of calcium supplementation on the prevention of preeclampsia in expectant mothers. All pregnant women who were the targets of the study were included in the study population, with a total sample size of 90 respondents obtained using total sampling methods. Because the data being analyzed was on an ordinal scale, the Kendall's tau b correlation test was used to conduct bivariate analysis. With a correlation coefficient value of $\tau = 0.672$ and a p value of 0.000 (0.01), the study's findings revealed a strong and statistically significant link between calcium supplementation and the occurrence of preeclampsia. According to these findings, calcium supplementation has a substantial impact on preventing preeclampsia and is crucial in lowering the risk of preeclampsia in expectant mothers.

Keywords: Antenatal Care; Calcium Supplementation; Maternal Health; Preeclampsia Prevention; Pregnancy Risk

1. INTRODUCTION

Hypertension during pregnancy is a frequent medical issue that can greatly affect both the mother and the baby's well-being. This condition emerges as elevated blood pressure in women who normally had healthy readings, occurring after the 20-week mark of pregnancy. The American College of Obstetricians and Gynecologists (ACOG) identifies three primary types of hypertensive disorders during pregnancy: gestational hypertension, preeclampsia, and chronic hypertension. In Indonesia, hypertension during pregnancy, particularly preeclampsia, remains a leading factor contributing to elevated maternal mortality rates (Rahayu et al. , 2025).

Preeclampsia is a specific syndrome in pregnancy characterized by impaired organ perfusion due to vasospasm and endothelial activation. Until now, preeclampsia is still a serious pregnancy complication with pathophysiological mechanisms that are not fully understood. However, this condition can generally be recognized through clinical manifestations in the form of increased blood pressure, proteinuria, and edema (Bingan, 2018).

The number of preeclampsia cases around the world has gone up by 10. 92%, rising from 16. 30 million to 18. 08 million between 1990 and 2019. Preeclampsia happens in about 2 to 5% of pregnancies and leads to higher rates of health issues and deaths for mothers and newborns (Widiastuti et al. , 2020). In Indonesia, pregnancy-related high blood pressure (HDK)

remains a serious health concern and is one of the top three causes of maternal fatalities. According to information from the Ministry of Health of the Republic of Indonesia, there were 1,077 maternal deaths due to HDK in 2021 (Abdiwijoyo et al. , 2023).

Developing nations often experience a greater occurrence of preeclampsia compared to developed nations, a situation that is partially attributed to disparities in the quality of and access to prenatal care services. The occurrence of preeclampsia is affected by several factors, such as genetics, race, number of pregnancies, environment, age of the mother, and previous hypertension history (Gustirini, 2019). Numerous studies indicate that a background of high blood pressure is the primary risk factor for preeclampsia. This situation is highly perilous as it may have severe consequences for both the mother and the fetus. In the fetus, preeclampsia may lead to low birth weight (LBW) because of spasms in the decidual arterioles, which decrease blood flow to the placenta and interfere with its function. This condition may lead to a shortage of oxygen for the fetus, reduced growth of the fetus (intrauterine growth restriction/IUGR), and potentially result in death during pregnancy. At the same time, in mothers, preeclampsia may lead to severe complications, including placental detachment, low fibrinogen levels, destruction of red blood cells, bleeding in the brain, damage to small blood vessels, vision problems ranging from impairment to blindness, fluid buildup in the lungs, liver cell death, and diminished heart function. If preeclampsia becomes more severe and turns into eclampsia, the likelihood of a mother dying will rise considerably (Deka et al. , 2022).

A crucial initiative to prevent preeclampsia in pregnant women involves providing high-quality antenatal care (ANC). This includes the early identification of risk factors that may lead to complications during pregnancy, labor, and the postpartum phase. In line with the strong advice from the World Health Organization (WHO), the Indonesian government, via the Ministry of Health, suggests that all pregnant women should receive calcium supplements as a preventive step against preeclampsia, particularly for those at high risk and in regions where calcium intake is low. Calcium supplements are provided at a daily dosage of 1.5 to 2 grams during pregnancy (Dahniarti et al. , 2018).

From a physiological standpoint, taking calcium supplements helps to prevent preeclampsia by maintaining stable levels of calcium in the serum. This condition will lower the levels of calcium inside cells, which will decrease the ability of vascular smooth muscle to contract and encourage the widening of blood vessels. This system helps to keep blood pressure at a normal level during pregnancy. Consequently, recognizing pregnant women who consume insufficient calcium is a crucial initial step in formulating strategies and policies aimed at lowering the likelihood of preeclampsia (Harahap and Fitriani, 2021).

According to this description, the author intends to explore the impact of providing calcium supplements during the first trimester on reducing the occurrence of preeclampsia in pregnant women at the Dulupi Public Health Center.

2. RESEARCH METHODS

The purpose of this study, which employs a quantitative methodology with a correlational analytical design, is to determine how calcium supplementation affects the prevention of preeclampsia in pregnant women. All expectant women who were the subjects of the study made up the research population, and a sample size of 90 respondents was chosen using total sampling methods. The study collected information on respondents' parity, age, education level, and other characteristics, as well as information on the prevalence of preeclampsia and calcium supplementation. The frequency distribution of each variable was described using a univariate data analysis. The relationship between calcium supplementation and the occurrence of preeclampsia was assessed using a bivariate data analysis using the Kendall's tau b test at a significance level of $\alpha = 0.01$.

3. RESULTS AND DISCUSSION

Univariate Analysis

Table 1. Frequency Distribution Based on Maternal Age.

Category	Frequency	Percentage (%)	Valid Percentage (%)	Accumulative Percentage (%)
<20 Years	8	8.9	8.9	8.9
20-35 Years	76	84.4	84.4	93.3
35 Years	6	6.7	6.7	100.0
Total	90	100.0	100.0	

According to Table 1, the age distribution of mothers reveals that most participants fall within the 20 to 35-year-old category, specifically 76 individuals (84.4%). Additionally, there were 8 participants who were under 20 years old (8.9%), and 6 participants who were above 35 years old (6.7%). In total, there were 90 participants in this research (100%), suggesting that the majority of mothers were at a safe age for reproduction.

Table 2. Frequency Distribution Based on Mother's Education.

Category	Frequency	Percentage (%)	Valid Percentage (%)	Accumulative Percentage (%)
Elementary School	4	4.4	4.4	4.4
Junior High School	11	12.2	12.2	16.7
Senior High School	72	80.0	80.0	96.7
PT	3	3.3	3.3	100.0
Total	90	100.0	100.0	

According to the information in Table 2, most of the mothers surveyed completed high school, with a total of 72 participants (80.0%). There were 11 mothers who finished junior high school (12.2%) and 4 who completed elementary school (4.4%). The smallest group was the mothers with higher education, which included just 3 participants (3.3%). Overall, from a total of 90 mothers (100%), it can be said that most of them have a high school diploma.

Table 3. Frequency Distribution Based on Number of Children.

Category	Frequency	Percentage (%)	Valid Percentage (%)	Accumulative Percentage (%)
Primigravida	30	33.3	33.3	33.3
Multigravida	58	64.4	64.4	98.9
Grandemultigravida	2	2.2	2.2	100.0
Total	90	100.0	100.0	

According to Table 3, the distribution of responses concerning the number of children indicates that most respondents are classified as multigravida, totaling 58 individuals (64.4%). Additionally, the number of participants who were first-time mothers was 30 individuals (33.3%), whereas the grandemultigravida group consisted of only 2 individuals (2.2%). Out of 90 respondents (100%), it can be deduced that most mothers in this research have experienced more than one pregnancy.

Table 4. Frequency Distribution Based on Level of Calcium Supplementation.

Category	Frequency	Percentage (%)	Valid Percentage (%)	Accumulative Percentage (%)
Yes	74	82.2	82.2	82.2
No	16	17.8	17.8	100.0
Total	90	100.0	100.0	

The frequency distribution of calcium supplement levels, as shown in Table 4, demonstrates that the majority of respondents—74 individuals, or 82.2%—were given calcium supplements. In contrast, 16 respondents (17.8%) did not receive calcium supplementation. The majority of the pregnant women in this study had taken calcium supplements, as shown by the 90 respondents (100%).

Table 5. Frequency Distribution Based on PE Occurrence.

Category	Frequency	Percentage (%)	Valid Percentage (%)	Accumulative Percentage (%)
No PE	82	91.1	91.1	91.1
PE	8	8.9	8.9	100.0
Total	90	100.0	100.0	

According to Table 5, the occurrence of preeclampsia indicates that most participants did not have this condition, specifically 82 individuals, which accounts for 91.1%. Conversely, 8 individuals reported having preeclampsia, representing 8.9%. Therefore, from the total of 90 participants, it can be determined that most pregnant women involved in this research did not have preeclampsia.

Bivariate Analysis

Table 6. Effect of Calcium Supplementation on Preeclampsia Prevention in Pregnant Women.

			Knowledge	Selection of birth control methods
Kendall's tau_b	Calcium Supplementation	Correlation Coefficient	1.000.	.672**
		Sig. (2-tailed)		.000
		N	90	90
	PE occurrence	Correlation Coefficient	.672**	1.000.
		Sig. (2-tailed)	.000	
		N	90	90

The findings of the analysis using the Kendall's tau b correlation test, as shown in Table 6, demonstrate a clear and statistically significant association between calcium supplementation and the occurrence of preeclampsia in pregnant women. For 90 respondents, the correlation coefficient value was determined to be $\tau = 0.672$, with a significance level of $p = 0.000 (< 0.01)$. Since calcium supplementation has a statistically significant impact on the prevention of preeclampsia in pregnant women, it may be inferred that calcium supplementation helps lower the incidence of the condition.

Effect of Calcium Supplementation Since the First Trimester on Preventing Preeclampsia in Pregnant Women

According to the study's findings, the majority of pregnant women are between the ages of 20 and 35, which is considered to be the safest reproductive age range (84.4%), have a high school education (80.0%), and have multigravida status (64.4%). Most respondents did not have preeclampsia (91.1%), and the majority had calcium supplementation during pregnancy (82.2%). The bivariate analysis using the Kendall's tau b test revealed a significant statistical association between calcium supplementation and the occurrence of preeclampsia, as indicated by a correlation coefficient of $\tau = 0.672$ and p value = 0.000 (<0.01). As a result, calcium supplementation can be said to have a significant role in lowering the incidence of preeclampsia in expectant mothers.

The findings of Lieskusumastuti et al. (2024)'s research have a significant relationship with the degree to which pregnant women are informed about calcium supplementation as a means of preventing preeclampsia, as evidenced by a p value of 0.039 (<0.05). A systematic review of qualitative studies examining women's attitudes and experiences toward antenatal care supports this, demonstrating that pregnant women often see antenatal care as their primary source of health knowledge and information. Due to the fact that they are seen as contributing to the birth of a healthy child and contributing to a positive pregnancy experience, expectant women often value all guidance given by health professionals, including dietary and nutritional intake recommendations.

This discovery is consistent with Nauli et al. (2020), whose research suggests that calcium supplementation has a considerable impact on lowering systolic and diastolic blood pressure in pregnant women with preeclampsia. The paired sample t-test in the intervention group with a significance level of $\alpha = 0.05$ yielded a p value of 0.000 (0.05), thus we rejected H_0 . Therefore, calcium supplementation may be seen to have clinical advantages in lowering blood pressure in moms with preeclampsia, as well as in improving the knowledge of expectant mothers.

Calcium supplementation during pregnancy is crucial because calcium is a vital mineral for maintaining maternal health and promoting fetal development. Calcium is involved in the blood coagulation process, the nervous system, muscular function, and the development of fetal bones and teeth. Calcium needs rise during pregnancy as the baby develops and the mother's metabolic requirements rise. Nonetheless, particularly in pregnant women with imbalanced diets, lactose intolerance, or other dietary restrictions, daily food consumption alone may not meet their calcium requirements. A calcium deficiency during pregnancy might have negative consequences, such as interfering with the formation of fetal bones and raising the mother's chance of developing osteoporosis after childbirth (Pasorong, 2021). Additionally, a number of studies have demonstrated that calcium supplementation may help lower the risk of preeclampsia, a severe hypertensive condition that can occur during pregnancy. As a result, calcium supplementation is a key component of attempts to keep pregnant women healthy, promote fetal development, and avoid pregnancy problems that might endanger the mother and child (Adyani, 2020).

According to Irmayanti and colleagues (2021), a prolonged lack of calcium can lead the body to draw calcium from muscular tissues to fulfill its requirements. This situation could enhance the contraction ability of smooth muscles in blood vessels, potentially leading to elevated blood pressure or hypertension. If this happens among expectant mothers, the likelihood of developing preeclampsia increases. This aligns with a study by Damayanti and others (2020), which indicates that pregnant women who consistently consumed adequate calcium experienced lower blood pressure and maintained it within a normal range throughout pregnancy up to delivery. Conversely, those who rarely ingested calcium often showed a slower and less stable reduction in blood pressure.

From these observations, researchers contend that calcium plays a vital role in mitigating and regulating blood pressure in pregnant women, particularly in those with a history of preeclampsia. Consequently, it is strongly advised that expectant mothers consume calcium regularly every day. The intake of calcium should commence early, specifically

starting at 20 weeks of pregnancy, in accordance with recommendations from the World Health Organization (WHO). The advised daily intake of calcium is between 1,500 and 2,000 mg, equivalent to three doses of 500 mg each. Calcium supplements should be provided to all pregnant women who have reached the 20-week mark, and health care professionals, particularly midwives, must actively educate, ensure proper administration, and monitor adherence to calcium intake to meet the calcium needs of pregnant women in line with WHO guidelines (Nugroho et al. , 2020).

4. SOLUSION

The suggested action from this study is to improve the use and adherence to calcium supplements among pregnant women to help avoid preeclampsia. Healthcare providers should enhance their education and guidance for pregnant women about why calcium supplements are important, especially for those who are at higher risk. They must also make sure that calcium supplements are available and fairly distributed through antenatal care services. Furthermore, regular checks on how well pregnant women are following their calcium supplement plans need to be done, along with strengthening family support for these women. The results of this study can also help in creating policies and developing health programs aimed at lowering the rates of preeclampsia in care facilities.

Acknowledgement: The author expresses his appreciation and thanks to all parties who have played a role in carrying out this research, especially to pregnant women who were willing to participate as respondents. Thanks are also addressed to the health workers and the Dulupi Public Health Center who have provided permission and support in the data collection process. Apart from that, the author would like to express his appreciation to the supervisor and all parties who have provided guidance, suggestions and motivation so that this research can be completed well.

REFERENCES

- Abdiwijoyo, M., Efrany, E., Adhirajasa, F., Arinda, T. W. P., & Saputra, H. (2023). Aspirin and Calcium in the Prevention of Pre-eclampsia: A Literature Review. *SUPLEMEN*, 15, 1–9.
- Adyani, K. (2020). Calcium Diet for Pregnant Women. *EMBRIO: Midwifery Journal*, 12(1), 31–42.
- Bingan, E. C. S. (2018). The Effect of Calcium Supplementation on Blood Pressure in Pregnant Women with Hypertension. *JIDAN (Midwifery Scientific Journal)*, 6(1), 17–24.
- Dahniarti, D., Idris, I., & Am, N. (2018). The Effect of Compliance with Modified Calcium

- Tablet Supplementation on Calcium Levels and Blood Pressure in Pregnant Women. *Palapa: Journal of Islamic Studies and Education*, 6(1), 19–33.
- DAMAYANTI, FITRIANI, HANDAYANI, D., ANUHGERA, D. E., & GINTING, N. (2020). THE EFFECT OF CALCIUM TABLET CONSUMPTION ON BLOOD PRESSURE CHANGES IN PREGNANT WOMEN AT HIGH RISK OF HYPERTENSION DURING PREGNANCY IN THE WORKING AREA OF THE PAYALOMBANG TEBING TINGGI COMMUNITY HEALTH CENTRE. *Kestra Midwifery Journal (JKK)*, 3(1), 82–88. <https://doi.org/10.35451/jkk.v3i1.510>
- Deka, I. T., Cahya, S. N., & Alhida, S. V. (2022). The Effectiveness of Calcium and Folic Acid Supplementation in Preventing Pre-eclampsia: Literature Review. *JMSWH Journal of Midwifery Science and Women's Health*, 3(1), 1–7. <https://doi.org/10.36082/jmswh.v3i1.564>
- Gustirini, R. (2019). CALCIUM SUPPLEMENTATION IN PREGNANT WOMEN TO REDUCE THE INCIDENCE OF PREECLAMPSIA IN DEVELOPING COUNTRIES. *Midwifery Journal*, 8(2), 151–160.
- Harahap, N., & Fitriani, W. N. (2021). Compliance with Calcium Supplement Intake in Primiparous and Multiparous Mothers with Preeclampsia. *Journal of Public Health*, 10(2), 110–117.
- Irmayanti, Tandiallo, D., & Ibrahim, F. (2021). Changes in Blood Pressure with Calcium Intake in Pregnant Women with a History of Pre-eclampsia. *Indonesian Midwifery Journal*, 11(1), 12–16.
- Lieskusumastuti, A. D., Sab'ngatun, Hasanah, Y. I. F., & Setyorini, C. (2024). KNOWLEDGE OF PREGNANT WOMEN ABOUT CALCIUM SUPPLEMENTATION AS PREVENTION OF PREECLAMPSIA. *Indonesian Midwifery Journal*, 15(1), 171–182.
- Nauli, E., Devi Kurniasari, & Utami, V. W. (2020). THE EFFECT OF CALCIUM SUPPLEMENTATION ON BLOOD PRESSURE REDUCTION IN PREECLAMPSIA MOTHERS AT THE GEDUNG NEGARA HEALTH CENTRE, NEGARA RATU HEALTH CENTRE, AND BATU NANGKOP HEALTH CENTRE IN NORTH LAMPUNG REGENCY. *JOURNAL OF MIDWIFERY*, 6(2), 236–243.
- Nugroho, H., Masturoh, S. A., & Pertiwi, R. W. (2020). THE EFFECT OF CALCIUM SUPPLEMENT COMPLIANCE ON NORTH JAKARTA IN 2017. *STIKes IMC Bintaro Health Journal*, III(1), 56–64.
- Pasorong, N. Y. (2021). THE EFFECT OF CALCIUM LACTATE ADMINISTRATION IN PREGNANT WOMEN ON THE INCIDENCE OF SEVERE PRE-ECLAMPSIA. *JURNAL CAHAYA MANDALIKA (JCM)*, 1328–1337.
- Rahayu, Fitriani, R. R., & Bohari, N. H. (2025). The efficacy of calcium tablets in preventing increased blood pressure during pregnancy in women with a history of pre-eclampsia. *Journal of Midwifery and Nursing Studies*, 7(2), 186–198.
- Widiastuti, R. O., Srw, D. W., & Sari, R. D. P. (2020). The Relationship Between Inadequate Calcium Supplement Consumption During Pregnancy and the Risk of Pre-eclampsia at the Regional General Hospital (RSUD) in Kota Agung, Tanggamus Regency. *Medula*, 10(1), 175–181.