



# RPCPE

ISSN 2613-943X (print)  
ISSN 2620-5572 (online)

Journal Homepage:  
<https://jurnal.ugm.ac.id/rpcpe>

Review of Primary Care Practice and Education  
(Kajian Praktik dan Pendidikan Layanan Primer)

## Factors Influencing the Occurrence of Preeclampsia in Pregnant Women at Primary Care Clinic

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To cite this article:

Andoko D, Hendrik, Moningkey S, Soeryani W, Sungono V. Factors influencing the occurrence of preeclampsia in pregnant women at primary care clinic. *Rev Prim Care Prac and Educ.* 2024;7(1):6-10.

### ABSTRACT

**Background:** Preeclampsia is a common medical complication during pregnancy, affecting approximately 5-15% of all pregnancies. This research aims to identify factors influencing the occurrence of preeclampsia at a Primary care clinic in Bandar Selamat, Tembung, Medan, in the year 2023. **Method:** This study adopts a cross-sectional approach, involving pregnant women with a gestational age of  $\geq 20$  weeks who visited the primary care clinic in Bandar Selamat, Tembung, Medan, from July to December 2023. A total of 37 respondents were sampled using convenience sampling. The dependent variable was the occurrence of preeclampsia, while independent variables included age, parity, medical history, calcium supplementation, and employment history. Multivariate analysis was conducted using SPSS version 23. **Result:** 16.8% of the respondents experienced preeclampsia. Additionally, 21.6% were in the unhealthy reproductive age group, 72.9% were primigravida, 13.5% had a medical history, 43.2% had poor calcium supplementation, and 40.5% were employed. Multivariate analysis revealed that Age (P-value: 0.044, OR: 24.5, 95% CI: 1.082 - 556.407), Parity (P-value: 0.252, OR: 4.926, 95% CI: 0.32 - 75.4), History of Chronic Disease (P-value: 0.32, OR: 40.484, 95% CI: 1.37 - 1196.2), Calcium Supplementation (P-value: 0.167, OR: 11.582, 95% CI: 0.3 - 374.8), and Employment Status (P-value: 0.679, OR: 1.849, 95% CI: 0.1 - 33.87) are associated with preeclampsia. **Conclusion:** There is a significant relationship between age, parity, history of chronic disease, and the occurrence of preeclampsia in pregnant women at the primary care clinic in Bandar Selamat, Tembung, Medan. History of Chronic Disease is the most influential variable (OR: 40.484).

**Keywords:** Age; parity; medical history; calcium; employment; preeclampsia

### INTRODUCTION

Globally, 50,000 to 70,000 deaths are reported annually due to preeclampsia, which contributes to approximately 16% of maternal deaths in developed countries. In the United States, the reported incidence of preeclampsia is 5% to 8% of all pregnancies<sup>1</sup>. Approximately 50,000 women each year worldwide die from preeclampsia. The incidence is around 2.8% according to a study report in Israel, 5.8% was reported in Scotland, 14.1% was reported in Australia and 5% was reported from Seattle. <sup>2</sup> According to the World Health Organization (WHO) the incidence of preeclampsia in high-income countries is 1.3% - 6%, while in lower middle income countries it is 1.8% - 18%.<sup>2</sup>

Preeclampsia is the main cause of death (15-20% in developing countries) and morbidity (acute and long-term) in pregnant women, perinatal death, premature birth, and intrauterine growth restriction. Preeclampsia occurs in around 1 in 20 pregnancies<sup>1</sup>. Preeclampsia can develop into eclampsia or convulsions, which according to reports in around 10 percent causes maternal death<sup>2</sup>.

Based on the 2023 Annual Report of the Medan Health

Service's Maternal and Child Health Program, there were 980 reports of cases of maternal morbidity, including preeclampsia/eclampsia (30.82%), abortion (25.61%), HAP (7.96%), and others (35.51%)<sup>3,4</sup>.

At the primary care clinic in Bandar Selamat, Tembung, Medan in 2023, there were 264 cases of maternal morbidity recorded with diagnosis such as anemia (17.8%), ectopic pregnancy (17.04%), eclampsia/preeclampsia (23.48%), abortion (5, 68%), and others (35.98%).

Age 20-35 years is the safest age for pregnancy and giving birth, but in reality there are still many mothers in developing countries, around 10%-20% who give birth at a young age<sup>2</sup>. Research in China found that women had a risk for preeclampsia of 1.8 times higher in those aged 35-39 years and 2.4 times higher in those aged 40 years and over<sup>1</sup>.

A study conducted in Brazil showed that the risk of preeclampsia in primiparas was more than twice (OR = 2.39; 1.23-4.65) compared to those with third parity. Preeclampsia was not found to be significantly associated with history of previous abortion, duration of pregnancy and sex of the last child of multiparous women<sup>3</sup>.

Both short and long pregnancy intervals are associated with an increased risk of preeclampsia. A recent large multicentric retrospective of 894,479 women reported that an interpregnancy interval of less than 12 months or more than 72 months was associated with a higher risk of preeclampsia compared with an interpregnancy interval of 12–23 months. It has been observed that the longer the interval, the higher the risk of preeclampsia<sup>4</sup>. The reasons for the association of short interpregnancy intervals with preeclampsia are unclear, but several hypotheses have been proposed, including factors related to socioeconomic status, postpartum stress, malnutrition, and inadequate access to health services. Meanwhile, the increased risk of preeclampsia in women with long pregnancies may be caused by maternal age, infertility, and underlying maternal medical conditions.

Another study by Duckitt & Harrington, found that when a woman was pregnant with twins, her risk of pre-eclampsia was almost 3 times greater (in five cohort studies, 2.93, 2.04 to 4.21). Neither chorionicity nor zygosity of pregnancy modifies this increased risk. One study found that triplet pregnancies had almost 3 times the risk of pre-eclampsia compared with twin pregnancies (2.83, 1.25 to 6.40)<sup>5</sup>.

Being overweight or obese was the most important risk factor for severe preeclampsia with the percentage risk attributed to a BMI greater than 25 of 64.4% (52.0-73.6). Driul et al. conducted a retrospective cohort study of 916 consecutive singleton pregnancies to evaluate the association between pre-pregnancy BMI and adverse maternal and neonatal outcomes. This study shows that obese women are 5 times more likely to experience preeclampsia. Excessive weight gain during pregnancy in women with normal pre-pregnancy BMI has been associated with increased rates of gestational hypertension. Additionally, it has been determined that glucose intolerance in pregnant women is associated with an increased risk of developing preeclampsia<sup>6</sup>.

In a population-based case-control study, it was found that the prevalence of chronic hypertension was higher in women who had preeclampsia than in women who did not have chronic hypertension (12.1% vs. 0.3%)<sup>7</sup>.

Superimposed pre-eclampsia had significantly higher rates of perinatal morbidity (odds ratio 8.8, 2.6 to 39.0), small for gestational age babies (5.6, 1.8 to 16.0), and delivery before 32 weeks (15.0, 5.7 to 38.0)<sup>3</sup>.

Wolf et al.'s research shows that mothers who had diabetes mellitus before pregnancy had a fourfold increase in risk of experiencing preeclampsia with an OR value of 3.56 (CI 95% 2.54-4.99). Another study from found diabetic primiparity and vasculopathy to be the strongest risk factors for preeclampsia in women with type 1 diabetes. However, pre-existing hypertension and higher levels of obesity during pregnancy were also associated with preeclampsia in women with T1DM. Among laboratory results, higher levels of HbA1c and TG in all three trimesters were associated with preeclampsia<sup>6</sup>.

Another study found that women with low calcium

supplementation had a higher risk of preeclampsia compared to women with sufficient calcium supplementation. It is known that calcium levels in the body can affect the function of the heart muscle, the heart muscle can contract more optimally with sufficient blood calcium levels, this balances cardiac output, which maintains the balance of the blood circulation system, and blood pressure<sup>3</sup>.

Work-related stress is also a risk factor for preeclampsia. Preeclamptic women were also more likely to work during pregnancy (adjusted OR, 2.1; 95% CI, 1.1 to 4.4). Women who work are 2.3 times more likely to develop preeclampsia than women who don't work. Epidemiological studies show that the relative risk for preeclampsia increases in many stressful situations<sup>5</sup>.

Based on this background, the formulation of the problem in this research is, "Are age, parity, multiple pregnancies, calcium supplementation, history of chronic disease, employment status a risk factor for the incidence of preeclampsia?" Although there have been similar studies, the research on these factors was carried out independently.

## METHODS

### Type and Research Design

The research method used is a quantitative research method. This research is a type of observational analytical research with a cross sectional approach, namely measuring the independent variables (risk factors) and dependent variables (effects) carried out at the same time. This research uses secondary data in the form of medical record data from the Bandar Selamat Tembung Medan Primary care clinic.

### Location and Time of Research

Held at the Primary care clinic in Bandar Selamat, Tembung, Medan, from May to December 2023.

### Research Subjects

#### 1. Population

Population is a generalized area consisting of objects/subjects that have certain qualities and characteristics determined by the researcher to be studied and then conclusions drawn. The population in this study were all pregnant women with a gestational age of  $\geq 20$  weeks who came to the Primary care clinic in Bandar Selamat, Tembung, Medan in the period May – December 2023.

#### 2. Sample

The sample is part of the number and characteristics of the population. The sampling technique in this study used Non Random Sampling, namely by taking all pregnant women with a gestational age of  $\geq 20$  weeks who came to the Primary care clinic in Bandar Selamat, Tembung, Medan in the period May – December 2023, namely 37 samples..

### Research Materials and Methods

The material used in collecting data for this research is in the form of medical record data, with data collection

through identification and observation of medical record data from the Primary Care Clinic in Bandar Selamat, Tembung, Medan.

**Research Procedures**

The steps that will be taken during the research include the following:

1. Research preparation
  - a. Collection of literature and other library materials
2. Data Collection
  - a. Collect data from patient medical records and process initial survey data
  - b. Grouping subjects according to the criteria for measuring results in the operational definition
3. Data Processing
  - a. Editing
  - b. Coding

1. Dependent Variable  
Preeclampsia occurs with code  
1 = Preeclampsia, 2 = No Preeclampsia.
2. Independent Variable
  - a. Mother's age with code 1 = <20 years or >35 years, 2 = 20-35 years.
  - b. Parity with code 1 = Multigravida, 2 = Primigravida
  - c. History of chronic disease with code 2 = absent, 1 = present.
  - d. Calcium supplementation with code 1 = Not enough, 2 = enough.
  - e. Employment Status with code 1 = working, 2 = not working
4. Data entry (entering data)  
Enter data into SPSS according to the questionnaire sheet that has been coded.

**RESULTS AND DISCUSSION**

**Table 4.1. Respondent Characteristics.**

Variable	n	%
<b>Occurrence of Preeclampsia</b>		
- Yes	6	16.8
- No	31	83.7
<b>Reproductive Age</b>		
- Healthy	29	78.3
- Unhealthy	8	21.6
<b>Parity</b>		
- Primigravida	27	72.9
- Multigravida	10	27.0
<b>History of Chronic Disease</b>		
- Present	5	13.5
- Absent	32	86.4
<b>Calcium Supplementation</b>		
- Inadequate	16	43.2
- Adequate	21	56.7
<b>Employment Status</b>		
- Employed	15	40.5
- Not Employed	22	59.4

Table 4.1 shows the results of univariate analysis where of the 37 respondents, 16.8% experienced preeclampsia. In addition, 21.6% were in the unhealthy reproductive age

group, 72.9% were primigravida, 13.5% had a medical history, 43.2% had poor calcium supplementation, and 40.5% were employed.

**Table 4.2. Relationship between variables and the incidence of preeclampsia**

Variable	Incidence of Preeclampsia		N (Total)	P Value	OR	95% CI
	Preeclampsia N	Non-Preeclampsia N				
<b>Reproductive Age</b>						
Unhealthy Age Range	4	4	8	0.013	13.5	1.83 - 99.3
Healthy Age Range	2	27	29			
<b>Parity</b>						
Multigravida	4	6	10	0.035	8.33	1.225 - 56.673
Primigravida	2	25	27			
<b>Chronic Disease History</b>						
Yes	4	2	6	0.022	14.5	1.69 - 124.2
No	3	29	32			
<b>Calcium Supplementation</b>						
Adequate	4	12	16	0.371	3.167	0.5 - 20.03
Inadequate	2	19	21			
<b>Employment Status</b>						
Employed	4	11	15	0.198	3.636	0.5 - 23.126
Unemployed	2	20	22			

Table 4.2. Bivariate analysis results show that there is a significant relationship between age and the incidence of preeclampsia with a p-value of 0.013 (p-value < 0.05,

OR 13.5 CI 95% 1.83 - 99.3). Based on data from previous research, the incidence of preeclampsia varies in each country and region due to various influencing factors, including age. It is known that elderly women who show an increase in the incidence of chronic hypertension with increasing age have a greater risk of experiencing preeclampsia<sup>6,8,9</sup>. Therefore, the research results are in line with the theory which states that the occurrence of preeclampsia is not solely caused by age, but by other factors such as medical history (diabetes, hypertension) may play a role.

Parity showed a significant relationship with the incidence of preeclampsia, with a p-value of 0.035 (p-value < 0.05 OR 8.33 CI 95% 1.225 – 56.673). The frequency of preeclampsia in primigravidas ranges from 3-10%, compared with multigravidas<sup>7,8,9,10</sup>. The results of the study show harmony with theory, which shows that multigravidas, especially those who have more than 4 children, may be medically predisposed to maternal disease and Mother. perinatal death. Multigravida can cause risks such as miscarriage, anemia, heavy bleeding, preeclampsia, eclampsia, placenta previa, and low birth weight.

History of chronic disease shows a significant relationship with the incidence of preeclampsia, with a p-value of 0.022 (p-value < 0.05 OR 14.5 CI 95% 1.69 – 124.2). Predisposing factors for preeclampsia include a family history of diseases such as preeclampsia and eclampsia, chronic kidney disease, molar pregnancy, and chronic hypertension<sup>2,10</sup>. The research results show harmony with the theory which shows that pregnant women with a history of the disease may have a history of the same disease. undergoing regular antenatal care (ANC) examinations, thus enabling early detection of pregnancy complications,

although several studies say different things show there is no relationship between medical history and the occurrence of preeclampsia<sup>9,10</sup>.

Calcium supplementation did not show a significant relationship with the incidence of preeclampsia, with a p-value of 0.371 (p-value > 0.05 OR 3,167 CI 95% 0.5-20.036). According to research by Camargo et al., calcium requirements increase during pregnancy for both maternal and fetal bone development<sup>11</sup>.

Adequate calcium intake can reduce the incidence of hypertension during pregnancy, reduce the risk of preeclampsia, and prevent premature birth<sup>12,13</sup>.

Previous studies have shown the effects of calcium supplementation during pregnancy on blood pressure and preeclampsia. Analysis showed a reduction in systolic blood pressure of 5.40 mmHg, indicating that calcium supplementation during pregnancy causes a significant reduction in systolic and diastolic blood pressure, as well as preeclampsia<sup>9</sup>. The lack of a significant association between calcium supplementation and preeclampsia contradicts this. raises questions about potential confounding factors in this study.

Employment status did not show a significant relationship with the incidence of preeclampsia, with a p-value of 0.198 (p-value > 0.05 OR 0.198 OR 3.635 CI 95% 0.572-23.126). According to research by Putri et al, employment status shows a weak relationship with the occurrence of preeclampsia, although high physical activity and stress during pregnancy are still risk factors for preeclampsia<sup>14,15</sup>.

After the bivariate stage, a joint multivariate analysis was carried out. The results of the first modeling in the multivariate analysis are presented below.

**Table 4.3. Multivariate Analysis Modeling**

<b>Variable</b>	<b>P Value</b>	<b>OR</b>
Age	0,044	24.5
Parity	0,252	4.926
History of Chronic Disease	0,32	40.484
Calcium Supplementation	0,167	11.582
Employment	0.679	1.849

Based on the modeling table, we excluded the variables calcium supplementation and employment status, but we found changes in variables with OR > 10%, so no variables were excluded from modeling and these two variables were considered confounders.

In the final modeling, it was found that the variables that were significantly related to the incidence of preeclampsia were the patient's age at the time of pregnancy and previous

history of the disease controlled by confounding variables, namely calcium consumption and employment status. The model formed was declared feasible because it met the model significance seen from the omnibus test value

(p: 0.04). Based on the Nagerkerke R Square, a value of 0.641 is obtained, meaning that the independent variables contained in the model can explain the incidence of preeclampsia 64%. The most dominant variable associated with the incidence of preeclampsia is a history of chronic disease with OR 14.5 (95% CI OR 1.69 - 124.2).

**CONCLUSIONS**

The study conducted at the Primary Care Clinic in Bandar Selamat, Tembung, Medan, identifies significant factors influencing the occurrence of preeclampsia in pregnant women. Among the 37 respondents, 16.8% experienced preeclampsia. The research highlights a significant



**Table 4.4. Final Modelling Result**

Variable	B	P Value	OR	CI 95%
Age	3.2	0,044	24.5	1.082 - 556.407
Parity	1.59	0,252	4.926	0.32 - 75.4
History of Chronic Disease	3.7	0,32	40.484	1.37 - 1196.2
Calcium Supplementation	2.44	0,167	11.582	0.3 - 374.8
Employment	0.61	0,679	1.849	0.1 - 33.87

Omnibus Test: pValue : 0.04

Nagerkerke R Square: 0.641

relationship between age, parity, medical history, and the incidence of preeclampsia. Specifically, older maternal age, being a primigravida, and having a history of chronic diseases are strongly associated with an increased risk of developing preeclampsia. Medical history emerged as the most influential factor, with an Odds Ratio (OR) of 14.5, indicating a strong predictive value for the occurrence of preeclampsia. These findings underscore the importance of considering these risk factors in prenatal care to mitigate the incidence of preeclampsia.

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