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## Relationship of preeclampsia in pregnant mothers with ureum and creatinin levels

Nurhadiah<sup>1</sup>✉, Laila Kamilla<sup>1</sup>, Linda Triana<sup>1</sup>, Maretalinia<sup>1</sup>

<sup>1</sup>Department of Medical Laboratory Technology, Politeknik Kesehatan Kementerian Kesehatan Pontianak, Pontianak, West Kalimantan, Indonesia

<sup>2</sup>Ph.D. Program in Demography, Institute Population and Social Research, Mahidol University, Nakhon Pathom, Thailand

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### Abstract

Preeclampsia is a complication of pregnancy due to increased blood pressure, accompanied by proteinuria and odema. Risk factors include primigravida, multiple pregnancy, extreme age at pregnancy, previous history of preeclampsia, family history, and diseases such as kidney, diabetes mellitus, and hypertension. The purpose of this study was to determine the relationship of preeclampsia with ureum and creatinine levels in pregnant women at RSUD Dr. Rubini Mempawah. This research is descriptive analytic with cross sectional approach. The population was all pregnant women who visited in May-July 2024 at RSUD Dr. Rubini Mempawah, with purposive sampling technique. Examination of ureum using Enzym Method and creatinine with IFCC Method. Of the 65 respondents, high ureum levels were found in 20 people (30.8%), with 7 people having preeclampsia and 13 people not. High creatinine levels were found in 21 people (32.3%), consisting of 11 people with preeclampsia and 10 without preeclampsia. Chi-Square test showed a p value = 0.438 (> 0.05) for ureum, indicating no relationship, so  $H_a$  was rejected. While p = 0.003 (<0.05) for creatinine, indicating there is an association, so  $H_a$  is accepted. In conclusion, there is no relationship between preeclampsia and ureum levels and there is a relationship between preeclampsia and creatinine levels in pregnant women at RSUD Dr. Rubini Mempawah.

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### Corresponding Author:

✉ Nurhadiah

Department of Medical Laboratory Technology, Politeknik Kesehatan Kementerian Kesehatan Pontianak, Pontianak, West Kalimantan, Indonesia

Email: [nurhadiah001@gmail.com](mailto:nurhadiah001@gmail.com)

## INTRODUCTION

The maternal mortality rate (MMR) is a key marker that can be used to survey the progress of maternal welfare programs. Maternal mortality consists of all deaths occurring during pregnancy, childbirth, and post-pregnancy that are attributable to treatment but not to different elements, such as accidents or incidents. MMR is all deaths in that extension in every 100,000 live births. The Ministry of Health's Maternal and Child Nutrition and Health Program usually records an increase in the number of maternal deaths each year. However, in 2022, there were 3,572 deaths in Indonesia, down from 7,389 deaths the previous year. In Indonesia, 3,572 people died in 2022, down from 7,389 in 2021. A total of 801 cases of hypertension during pregnancy, 741 cases of bleeding, 232 cases of heart disease, and 1,504 cases of other causes were the most common causes of maternal death (Kemenkes RI, 2023). One of the main causes of maternal and infant mortality is pregnancy complications related to high blood pressure. Blood pressure higher than 140/90 mmHg caused by pregnancy is known as pregnancy hypertension, which has the potential to cause serious problems for pregnant women (Sinambela & Mala Sari, 2018).

This complication is also called preeclampsia. The presence of protein in the urine (mother's urine), high blood pressure or hypertension and often swelling are the main symptoms of preeclampsia (Kurniawati et al., 2020). Having a family background of hypertension, conceptive age that is too young or old, primigravides and repeated pregnancies are risk factors for hypertension in pregnant women (Imaroh, 2018). Preeclampsia is one of the complications of increased blood pressure characterized by proteinuria or if proteinuria is not accompanied by several symptoms, such as thrombocytopenia, impaired renal function, impaired liver function, pulmonary edema, and headache (Adilita 2023) . Clinical conditions (high blood pressure, severe headache, vision changes, upper abdominal pain, and nausea or vomiting) and laboratory test results can be used to diagnose preeclampsia. Renal function tests reveal higher than normal values. Urea levels (from 17 to 50 mg/dl) and creatinine levels (from 0.5 to 0.9 mg/dl) are two laboratory tests used to evaluate kidney function. Changes in nitrogen balance and kidney function are explained by creatinine levels. Serum urea estimation can be used to survey renal ability, hydration status, nitrogen balance and assess the slow decline of renal ability due to renal tissue damage.

Vascular endothelial abnormalities lead to vascular disruption and vasospasm in preeclamptic patients. Thus, organ perfusion, especially to the kidneys, will be reduced, disrupting the blood filtration area in the kidneys (Ariefita et al., 2019). Endothelial dysfunction results in downregulation of nitric oxide synthesis in preeclampsia, which in turn leads to a decrease in glomerular filtration rate and ultimately an increase in urea and creatinine levels (Kinasih, 2019). Decreased nitric oxide synthesis can lead to systemic constriction of blood vessels, which is a major cause of hypertension. In , renal capillaries have a decreased ability to dilate blood vessels, resulting in decreased glomerular filtration rate and activation of the renin-angiotensin system. Angiotensin is an enzyme that causes blood vessels to narrow and eventually an increase in blood pressure (Amelia et al., 2018). In 2022, the causes of death in West Kalimantan Province in maternity were mostly caused by bleeding by 31%, hypertensive disorders by 23% and other causes were heart and blood vessel disorders, infections, covid 19 and others (Dinas Kesehatan Provinsi Kalimantan Barat, 2022). Based on data at RSUD Dr. Rubini Mempawah Regency shows that there is an increase from 2022 pregnant women with preeclampsia cases amounted to 122 cases from 972 deliveries to 188 cases 1,310 deliveries in 2023.

## METHOD

This study was designed using a descriptive analytic and cross-sectional approach. This design aims to explain how risk factors relate to effects, approaches, observations, or data collection at the same time. The population used in the study were all pregnant women who visited Dr. Rubini Mempawah Hospital from January to May 2024, a total of 102 people. While the sample used was 65 pregnant women who met the criteria of researchers, the sample was determined by purposive sampling technique.

The data used in this study are primary data, namely the results of the examination of ureum levels, creatinine levels, urine protein, and blood pressure. In addition, this study also used secondary data, namely the respondent's medical record data. The data obtained were then analyzed by univariate analysis and bivariate analysis. Univariate analysis was performed to determine the data distribution and characteristics of each variable. Frequency analysis, mean analysis, standard deviation analysis, and percentage analysis are some examples of univariate analysis. While bivariate analysis was used to determine the relationship of preeclampsia in pregnant women with ureum and creatinine levels.

## RESULTS AND DISCUSSION

This study was conducted to see the relationship between preeclampsia in pregnant women with ureum levels and creatinine levels. The number of respondents in this study obtained a sample of 65 pregnant women consisting of 17 pregnant women diagnosed with preeclampsia and 48 pregnant women who were not diagnosed with preeclampsia. The results of the study obtained as follows:

**Table 1.** Frequency Distribution Based on the Age of Pregnant Women in RSUD dr. Rubini Mempawah.

Age of Respondent	Frequency	Preeclampsia Status	
		Preeclampsia	No Preeclampsia
16 - 25 years	22 (33.8%)	3 (13.6%)	19 (86.4%)
26 - 35 years old	31 (47.7%)	8 (25.8%)	23 (74.2%)
36 - 45 years	11 (16.9%)	6 (54.5%)	5 (45.5%)
46 - 55 years	1 (1.5%)	0 (0%)	1 (100%)
Total	65	17	48

Table 1 describes the age characteristics of 65 respondents. The number of respondents aged 16-25 years was 22 people (33.8%), aged 26-35 years was 31 people (47.7%), aged 36-45 years was 11 people (16.9%) and aged 46-55 years was 1 person (1.5%). The results showed that the highest percentage of preeclampsia rates occurred at the age of 26-35 years and the age of 36-45.

**Table 2.** Frequency Distribution Based on Maternal Gestational Age in RSUD dr. Rubini Mempawah

Pregnancy Age	Frequency	Preeclampsia Status	
		Preeclampsia	No Preeclampsia
Trimester 2	3 (4,6%)	0 (0%)	3 (100%)
Trimester 3	62 (95.4%)	17(27.4%)	45 (72.6%)
Total	65	17	48

Table 2 describes the characteristics of the respondents' gestational age as many as 3 people (4.6%) were in the second trimester of pregnancy and 62 people (95.4%) were in the third trimester of pregnancy. The results showed that the highest percentage of preeclampsia rates occurred in the mother's gestational age in the third trimester.

**Table 3.** Frequency Distribution Based on the Results of Urine Protein Examination at RSUD dr. Rubini Mempawah.

Urine Protein	Total	Percentage (%)
Positive	16	24.6
Negative	49	75.4

Table 3 describes the characteristics of the urine protein examination results for respondents, specifically 16 people (24.6%) who were positive and 49 people (75.4%) who were negative.

**Table 4.** Frequency Distribution Based on Blood Pressure Examination Results at RSUD dr. Rubini Mempawah.

Blood Pressure	Total	Percentage (%)
High	17	26.2
Normal	48	73.8

Table 4 describes the characteristics of the blood pressure examination results for respondents, specifically 17 people (26.2%) who were positive and 48 people (73.8%) who were negative.

**Table 5.** Frequency Distribution Based on Blood Pressure Examination Results at RSUD dr. Rubini Mempawah

Preeclampsia Status	Frequency	Urine Protein		Blood Pressure	
		High	Normal	High	Normal
Preeclampsia	17(26.2%)	16(94.1%)	1(5.9%)	17(100%)	0(0%)
No Preeclampsia	48(73.8%)	0(0%)	48(73.8%)	0(0%)	48(100%)
Total	65	16	49	17	48

Table 5 describes the characteristics of the results of urine protein and blood pressure examination of respondents, namely 16 people (94.1%) positive and 1 person (5.9%) negative with preeclampsia while 48 (73.8%) people have negative results. The results of the high blood pressure examination of preeclampsia respondents were 17 people (100%) and normal blood pressure of non preeclampsia respondents were 48 people (100%).

**Table 6.** Frequency Distribution of Mother's Ureum Level at RSUD dr. Rubini Mempawah

Ureum Level	Total	Percentage (%)
High	20	30.8
Not High	45	69.2

Table 6 describes the characteristics of the results of the examination of ureum levels of respondents, it is known that 20 people (30.8%) have high ureum levels and 45 people (69.2%) have ureum levels that are not high.

**Table 7.** Frequency Distribution of Maternal Creatinine Level at RSUD dr. Rubini Mempawah

Creatinine Level	Total	Percentage (%)
High	21	32.3
Not High	44	67.7

Table 7 describes the characteristics of the results of the examination of creatinine levels of respondents, it is known that 21 people (32.3%) have high creatinine levels and 44 people (67.7%) have creatinine levels that are not high.

**Table 8.** Frequency Distribution of Preeclampsia Status in RSUD dr. Rubini Mempawah

Preeclampsia Status	Frequency	Ureum		Creatinine	
		High	Not high	High	Not high
Preeclampsia	17 (26.2%)	7	10	11	6
No Preeclampsia	48(73.8%)	13	35	10	38
Total	65	20	45	21	44

Table 8 explains the preeclampsia status of respondents, it was found that 17 people (26.2%) had preeclampsia and 48 people (73.8%) did not have preeclampsia. Of the 20 pregnant women with high ureum levels, 7 were preeclampsia and 13 were not preeclampsia while of the 45 pregnant women with ureum levels, 10 were preeclampsia and 35 were not preeclampsia. Of the 21 pregnant women with high creatinine levels, 11 were known to be preeclamptic and 10 were not preeclamptic while of the 44 pregnant women with non-high creatinine levels, 6 were preeclamptic and 38 were not preeclamptic.

**Table 9.** Chi-Square Analysis of the Relationship between Preeclampsia in Pregnant Women with Ureum Levels at RSUD dr. Rubini Mempawah

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.171 <sup>a</sup>	1	.279		
Continuity Correction <sup>b</sup>	.602	1	.438		
Likelihood Ratio	1.134	1	.287		
Fisher's Exact Test				.361	.217
Linear-by-Linear Association					
N of Valid Cases	1.153	1	.283		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.23

b. Computed only for a 2x2 table

The results of the *Chi-Square* statistical test analyzing the relationship between preeclampsia in pregnant women with ureum levels at RSUD Dr. Rubini Mempawah in the 2x2 table, the *Continuity Correction* value shows a significance value of *p-value* of 0.438 (> 0.05) which means there is no relationship between preeclampsia and ureum levels of pregnant women.

**Table 10.** Chi-Square Analysis of the Relationship between Preeclampsia in Pregnant Women with Creatinine Levels at RSUD dr. Rubini Mempawah.

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearso Chi-Square	11.049 <sup>a</sup>	1	.001		
Continuity Correction <sup>b</sup>	9.134	1	.003		
Likelihood Ratio	10.590	1	.001		
Fisher's Exact Test				.002	.002
Linear-by-Linear Association	10.879	1	.001		
N of Valid Cases	65				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.23

b. Computed only for a 2x2 table

The results of the *Chi-Square* statistical test analyzing the relationship between preeclampsia in pregnant women with creatinine levels at RSUD Dr. Rubini Mempawah in

the 2x2 table, showed a significance value of *p-value* of 0.003 (<0.05) which means there is a relationship between preeclampsia with creatinine levels of pregnant women.

## **DISCUSSION**

### **Age of Expectant Mother**

Descriptive data regarding the age of respondents, 47.7% of respondents aged 26-35 and 16.9% aged 36-45 years experienced preeclampsia, this explains that maternal age can be an important risk factor in the incidence of preeclampsia. *Chi-Square* test results showing *p-values* of 0.001 and 0.000 in previous studies support this assumption, indicating strong correlation between maternal age and the incidence of preeclampsia. In young women < 20 years old, the reproductive organs are not perfect as a whole and the psyche is not ready to become a mother, so pregnancy often ends with obstetric complications, one of is preeclampsia. Women aged > 35 years may have a degenerative process that affects peripheral blood vessels, resulting in functional and structural changes that play a role in changes in blood pressure, making them more susceptible to preeclampsia.

### **Gestational Age of the Mother**

Descriptive data regarding the gestational age of the mother, in this study the cases of preeclampsia occurred in the third trimester (week 28 to birth) given that this phase often shows a higher risk for such complications, more intensive attention and monitoring is needed to manage the risk of preeclampsia which increases significantly in this phase. In the third trimester, the fetus is maturing and ready to be born. The fetus will gain weight and length, and its organs will function perfectly. In the third trimester, pregnant women will also experience various physical changes, such as back pain, constipation, and difficulty sleeping (Arum et al., 2021).

### **Urine Protein and Blood Pressure**

Descriptive data regarding the results of urine protein examination showed that 48 people (73.8%) had negative results and 17 people (26.2%) showed positive results. Proteinuria is a condition where there are 300 mg of protein in the urine over a 24-hour period, or the equivalent of more than 1+ on a dipstick examination (Prawirohardjo, 2016). Proteinuria is an important indicator in diagnosing and assessing the prognosis of preeclampsia, a condition characterized by new-onset hypertension and proteinuria (Yousuf et al., 2016). This condition is considered a major sign of kidney damage and is a risk factor for the development of kidney disease (Osman & Maynard, 2019). In preeclampsia, proteinuria is associated with significant renal endothelial damage and has traditionally been used as one of the diagnostic criteria (Kim et al., 2017). The level of proteinuria, measured by the amount of protein in a urine sample, can help assess the severity of preeclampsia and predict outcomes for women experiencing the condition (Bouzari et al., 2014).

Research has shown that the level of proteinuria can correlate with adverse pregnancy outcomes, such as premature birth and fetal growth retardation (Dong et al., 2017). The results of blood pressure examination in this study showed high blood pressure of preeclampsia respondents as many as 17 people (100%) and normal blood pressure of non preeclampsia respondents as many as 48 people (100%). Hypertension in pregnancy (HDK) is 5% - 15% of pregnancy complications and is one of the three highest causes of maternal mortality and morbidity (Prawirohardjo, 2016). Preeclampsia, bleeding, heart disease, pulmonary edema, fetal distress, premature babies, IUFD (*Intra Uterine Fetal Death*), and placental abruption are signs of pregnancy-related complications caused by high blood pressure. These conditions can make mothers and babies experience more pain and death.

### **Ureum Level**

The results of the examination of ureum levels in pregnant women at RSUD Dr. Rubini Mempawah showed that preeclampsia between pregnant women with high ureum levels and women with non-high ureum levels. Although most pregnant women with high ureum levels did not experience preeclampsia, pregnant women who experienced the condition showed the influence of preeclampsia on the increase in ureum levels. In contrast, pregnant women with non-high ureum levels tended not to experience preeclampsia, although there were some who experienced the condition. Based on the research data, the statistical test results showed relationship between preeclampsia in pregnant women and ureum levels at RSUD Dr. Rubini Mempawah. All ureum and uric acid are excreted more effectively during pregnancy, so the concentration of these two substances in the blood is usually lower than the levels when not pregnant. During pregnancy, more glucose and lactose are excreted. Urea levels in pregnant women can be affected by several factors. Other studies have shown that severe preeclampsia can cause changes in ureum levels during pregnancy (Amalia et al., 2020). In addition, dehydration can cause an increase in blood urea and creatinine levels (Hasanah et al., 2020). Dehydration causes a decrease in extracellular volume which causes reduced tissue perfusion. Reduced tissue perfusion also inhibits kidney function, causing acidosis and high ureum in the blood (Yousuf et al., 2016).

### **Creatinine Level**

The results of the examination of creatinine levels in pregnant women at RSUD Dr. Rubini Mempawah show that high creatinine levels are greater in experiencing preeclampsia compared to pregnant women who have non-high creatinine levels. Most pregnant women with non-high creatinine levels did not experience preeclampsia, although there were some who experienced the condition. This finding suggests that preeclampsia can affect the increase in creatinine levels, indicating the influence of preeclampsia on kidney function. Based on the research data, the statistical test results showed that there was a relationship between preeclampsia and creatinine levels of pregnant women and there was no relationship between preeclampsia and ureum levels of pregnant women at RSUD Dr. Rubini Mempawah. Research shows that in pregnant women with severe preeclampsia, ureum and creatinine levels can change, although these changes may be small (Amalia et al., 2020).

Another study showed an association between the adequacy of micronutrients, such as vitamin D, sodium, and calcium, and the incidence of preeclampsia in pregnant women (Apriza et al., 2022). High creatinine levels in the blood often signal significant impairment of kidney function, especially in cases of severe preeclampsia (Rahman et al., 2019). Other studies have shown that regulating protein intake is very important, because high protein consumption can increase the workload of the kidneys in excreting metabolic waste, which in turn can cause an increase in serum ureum and creatinine levels (Malfica, 2023). In addition, nutritional intake also affects creatinine levels. For example, consuming large amounts of cooked meat can increase creatinine levels due to additional creatinine from outside the body (Novitasari et al., 2022).

### **Preeclampsia**

Descriptive data regarding preeclampsia status showed that 17 people (26.2%) had preeclampsia and 48 people (73.8%) did not have preeclampsia. Preeclampsia is one of the risky conditions in pregnant women. Preeclampsia is high blood pressure or hypertension with proteinuria that occurs in pregnant women, after 20 weeks of gestation ( $\geq 20$  weeks). However, preeclampsia can occur during pregnancy, labor, or after labor or the postpartum period.

## CONCLUSION

In conclusion, there is no relationship between preeclampsia and ureum levels and there is a relationship between preeclampsia and creatinine levels in pregnant women at RSUD Dr. Rubini Mempawah.

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