



# Antenatal care parameters that are the risk factors in the event of preeclampsia in primigravida<sup>☆</sup>

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## ABSTRACT

**Objective:** This study aimed to analyze the parameters of antenatal care, which becomes a risk factor against the incidence of preeclampsia in primigravidae in Kolaka.

**Methods:** The study uses case-control studies (case-control), which use a retrospective approach. The population in this study were all primigravida pregnant women recorded in the medical records at the BLUD Hospital. HM Djafar Harun as many as 5796 women and BLUD Benyamin Guluh Hospital as many as 5065 women. The sample in this case group is the primary mother Gravida, who suffered from preeclampsia from January 2014 to September 2018, and the control group was primigravida mothers who did not suffer from preeclampsia in the same period.

**Results:** The results showed that the age of primigravida mothers 14–28 years had a risk of 1.581 times more significant for having preeclampsia than the age group 29–49 years with CI (1.186–2.108), the incidence of hypertension in trimester 1 in primigravida mothers had a risk of 3.405 times greater for preeclampsia than mothers without a history of hypertension in trimester 1 with CI (2.164–5.358), irregular antenatal visits are 1.095 times more likely to develop preeclampsia than regular antenatal visits with CI (0.799–1.539), weight gain primigravida maternal body 1–10 kg 1.540 times greater risk of developing preeclampsia than 10–20 kg of weight gain with CI (1.074–2.207), pregnancy checks according to Antenatal Care non-compliant care standards are 1.333 times more likely to develop preeclampsia than primigravida mothers who obediently do the inspection antenatal care with CI (0.970–1.831).

**Conclusion:** Variables that are very risky with preeclampsia in primigravida mothers based on multivariate analysis are the hypertension incidence in the first trimester with an OR: 3.363 with a CI value of 2.126 and a lower value of 5.318.

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## Introduction

Preeclampsia is a disease in pregnant women which is characterized by high blood pressure and proteinuria in pregnancy >20 weeks which occurs in 2–8% of pregnancies.<sup>1,2</sup> WHO (*World Health Organization*) estimates the incidence of preeclampsia to be seven times higher in developing countries (2.8% of live births) compared to developed countries (0.4%) and is a leading cause of maternal, fetal, and neonatal death, especially in low- and middle-income countries.<sup>3,4</sup>

According to WHO preeclampsia affects seven to ten percent of all pregnancies in the United States. In the UK, less than 10 women die from preeclampsia each year, affecting maternal mortality. In the least developed countries, there are 50,000 maternal deaths caused by preeclampsia and eclampsia. On the other hand, the incidence of eclampsia in developing countries is around 1 case per 100 pregnancies to 1 case per 1700 pregnancies. In African coun-

tries such as South Africa, Egypt, Tanzania Ethiopia dam varies from 1.8% up to 7.1%. In Nigeria, the prevalence is about 2% up to 16.7%.<sup>3</sup>

Primiparity, early age of menarche (12 years), preobese, obesity, age >30 years, multiple pregnancies, anemia, previous preeclampsia, Diabetes mellitus, chronic hypertension, acute kidney disease, family history of hypertension are risk factors that increase the incidence of preeclampsia.<sup>5–7</sup> Bodnar et al. (2015) suggest the measurement of fat mass to recognize preeclampsia in obese women because the results of their study indicate that an increase in body mass index (BMI) in the normal range is also associated with an increased risk of preeclampsia.<sup>8</sup>

According to *Tigor H. Situmora* research, 2016 with the results, there is a relationship between age, knowledge, and the incidence of preeclampsia, and there is no relationship between parity, history of hypertension, antenatal care examination with the incidence of preeclampsia in pregnant women in the MCH clinic (maternal and child health) Anutapura General Hospital Palu.<sup>9</sup>

This research is important to compare the history of ANC (antenatal care) examination between primigravida mothers who have preeclampsia and those not affected by preeclampsia based on ANC (antenatal care) examination parameters, to see whether ANC (antenatal care) can be a predictor of preeclampsia in primigravida. Based on this, the purpose of this study is to analyze the antenatal

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care parameters that are predictors of risk factors for the incidence of preeclampsia in primigravida in the Kolaka Regency.

## Research methods

Types and designs were used case-control study and have accepted ethical approval from the ethical committee of medicine faculty, Hasanuddin University.

### Population and sample techniques

The population in this study were all primigravida pregnant women recorded in the medical record data at the BLUD Hospital. HM Djafar Harun as many as 5796 women and BLUD Benyamin Guluh Hospital as many as 5065 women. The sample in this study was a primigravida mother suffering from preeclampsia recorded in the medical record data at the BLUD Hospital. HM Djafar Harun and BLUD Hospital Benyamin Guluh for the period of 2014 to September 2018. The sample in this study were all primigravida mothers recorded in the medical record at the BLUD Hospital. HM Djafar Harun and BLUD Hospital. Benjamin Guluh period 2014 to September 2018. Data obtained from hospitals either of the cases or the control group, then draw the case and control groups through the mother's name were obtained from the *sampling frame* patient's medical record *antenatal care* in hospitals Djafar Harun period from 2014 until September 2018 as many samples required in research which is the category of cases as many as 179 people and a control group of 179 people and BLUDs RS Benjamin Guluh period from 2014 until September 2018 as many samples required in research which is the category of cases as many as 248 people and a control group as many as 248 people.

### Data analysis

Data analysis was performed using bivariate and multivariate analysis.

## Results

The results showed that the age of primiparous mothers 14–28 (year) was at risk 1.581 times, compared with the age of mothers 29–49 (year) with a range 1.186–2.108 times. Thus it can be concluded that there was a mother's age at risk preeclampsia in primigravida mothers, and a  $p$ -value (0.002) < 0.005 indicates a relationship between maternal age and the incidence of preeclampsia in primigravida mothers (Table 1).

Mothers with a history of diabetes have a risk of 0.844 times, compared to mothers who do not have a history of diabetes in the range 0.528–1.346. Thus it can be concluded that the history of maternal diabetes is not at risk of preeclampsia in primigravida mothers, and a  $p$ -value is obtained ( $p$  0.475) > 0.005, which indicates that there is no relationship between maternal diabetes history and the incidence of preeclampsia in primigravida mothers (Table 1).

Nutritional status is less risk 0.859 times, compared to good nutritional status with a range 0.610–1.209, thus it can be concluded that nutritional status is not at risk for preeclampsia in primigravida mothers, and a  $p$ -value (0.838) > 0.005 indicates that there is no relationship between nutritional status and the incidence of preeclampsia in primigravida mothers (Table 1).

Table 2 shows that Multiple Pregnancy has a risk of 0.767 times, compared to a Single Pregnancy with a range 0.446–1.319. Thus, it can be concluded that Multiple Pregnancy is not at risk for preeclampsia in primigravida mothers. Furthermore, a  $p$ -value (0.337) > 0.005 shows no relationship between multiple maternal

pregnancies and the incidence of preeclampsia in primigravida mothers.

The incidence of hypertension in trimester 1 has a risk of 3.405 times, compared to not having a history of hypertension in the range 2.164–5.358. Thus, it can be concluded that hypertension events in trimester 1 have a risk of preeclampsia in primigravida mothers, and a  $p$ -value (0.000) < 0.005 indicates a relationship between the incidence of hypertension in trimester 1 to the incidence of preeclampsia in primigravida mothers.

Irregular antenatal visits risk 1.095 times, compared to regular visits with a range 0.779–1.539. Thus, it can be concluded that antenatal visits are at risk of preeclampsia in primigravida mothers, and a  $p$ -value (0.602) > 0.005 indicates no relationship between maternal antenatal visits and the incidence of incidence preeclampsia in primigravida mothers.

Table 3 shows that weight gain of 1–10 kg has a risk of 1.540 times, compared to a weight gain of 10–20 kg with a range of 1.074–2.207. Thus it can be concluded that weight gain is at risk of preeclampsia in primigravida mothers and is obtained  $p$  (0.000) < 0.005. This indicates a relationship between BB increase and the incidence of preeclampsia in primigravida mothers.

Non-compliant ANC examination has a risk of 1.333 times, compared to compliant ANC examination with a range 0.970–1.831. Thus it can be concluded that the ANC examination is at risk of preeclampsia in primigravida mothers, and obtained  $p$  values (0.076) > 0.005 things this shows that there is no relationship between ANC examination and the incidence of preeclampsia in primigravida mothers.

Non-anemia HB examination has a risk of 0.879 times, compared to hemoglobin examination with a range 0.634–1.268. Thus it can be concluded that HB examination is not at risk of preeclampsia in primigravida mothers, and obtained  $p$  values (0.537) > 0.005. This shows that there is no relationship between HB examination and the incidence of preeclampsia in primigravida mothers.

Table 4 shows the results of multivariate analysis using logistic regression for the five variables it appears that the variables that most influence the incidence of preeclampsia in primigravida at the BLUD Hospital. HM Djafar Harun and BLUD Hospital. Benjamin Guluh, Kolaka, namely the variable hypertension in trimester 1 with an OR: 3.363 with a CI value of 2.126 and an upper value of 5.318.

## Discussion

The results showed that the age of primiparous mothers 14–28 years had a risk of 1.581 times, compared to the age of mothers 29–49 (year) with a range 1.186–2.108 times. These results concur with his research finding that preeclampsia is more common at age >35 years.<sup>10</sup> Age is one of the factors that can determine the health of pregnant women. Nevertheless, in preeclampsia, age is not the only risk factor for the emergence of preeclampsia, but there are other factors such as nullipara, multiple pregnancies, obesity, history of the disease, genetic and preeclampsia in previous pregnancies.<sup>5,11</sup>

Mothers with a history of diabetes have a risk of 0.844 times, compared to mothers who do not have a history of diabetes in the range 0.528–1.346. Thus it can be concluded that the history of maternal diabetes is not at risk for preeclampsia in primigravida mothers.

Nutritional status is less risky 0.859 times, compared to good nutritional status with a range 0.610–1.209. Other studies have shown that assessing the nutritional status of pregnant women includes evaluating risk factors, diet, anthropometric measurements, and biochemistry.<sup>12</sup> For example, a cohort study found that mothers with a body mass index >35 had a doubled risk of developing preeclampsia. Another study comparing mothers with low

**Table 1**

Risk factors for the incidence of preeclampsia in primigravida based on age, history of diabetes, and nutritional status in BLUD RSHHDjafar Harun and BLUD RS. Benjamin Guluh of Kolaka Regency.

Risk factors	Preeclampsia				Total	(p)	CI	(OR)
	Case		Control					
	N	%	N	%				
<i>Age</i>								
14–28 (year)	290	70.0	247	59.7	537	(0.002)	1.581	(1.186–2.108)
29–49 (year)	124	30.0	167	40.3	291			
Total	414	100.0	414	100.0	828			
<i>Diabetes history</i>								
There is	36	8.7	42	10.1	78	(0.475)	0.844	(0.528–1.346)
There is no	378	91.3	372	89.9	750			
Total	414	100.0	414	100.0	828			
<i>Nutritional status</i>								
Less	77	18.6	87	21.0	164	(0.383)	0.859	(0.610–1.209)
Well	337	81.4	327	79.0	664			
Total	414	100.0	414	100.0	828			

Secondary data sources 2019.

**Table 2**

Risk factors for preeclampsia in primigravida based on multiple pregnancies, the incidence of hypertension and antenatal visits in BLUD RS. HMDjafar Harun and BLUD Hospital. Benjamin Guluh of Kolaka Regency.

	Preeclampsia				Total	(p)	CI	(OR)
	Case		Control					
	N	%	N	%				
<i>Double pregnancy</i>								
Double	25	6.0	32	7.7	57	(0.337)	0.767	(0.446–1.319)
Single	389	94.0	382	92.3	771			
Total	414	100.0	414	100.0	828			
<i>Incidence of hypertension in trimester 1</i>								
There is	386	93.2	332	80.2	718	(0,000)	3.405	(2.164–5.358)
There is no	28	6.8	82	18.9	110			
Total	414	100.0	414	100.0	828			
<i>Antenatal visit</i>								
Irregular	86	20.8	80	19.3	166	(0.602)	1.095	(0.779–1.539)
Regular	328	79.2	334	80.7	662			
Total	414	100.0	414	100.0	828			

Secondary data sources 2019.

and normal body mass index found that the risk of preeclampsia decreased dramatically in mothers with a body mass index <20.<sup>13</sup>

Multiple pregnancies have a risk of 0.767 times, compared to single pregnancies with a range 0.446–1.319. Thus it can be concluded that multiple pregnancies are not at risk for preeclampsia in primigravida mothers. However, when a mother contains more than one fetus in her womb, the mother's risk of experiencing preeclampsia increases almost threefold. For example, one study showed that pregnant women with three fetuses had a threefold greater risk of developing preeclampsia than those with two fetuses.<sup>14</sup>

The incidence of hypertension in trimester 1 has a risk of 3.405 times, compared to not having a history of hypertension in the range 2.164–5.358. Thus it can be concluded that the incidence of hypertension in trimester 1 is at risk of preeclampsia in primigravida mothers. Furthermore, a history of chronic hypertension experienced during pregnancy can increase the risk of hypertension in pregnancy, where complications can result in *superimposed preeclampsia* and chronic hypertension in pregnancy.<sup>15</sup>

Irregular antenatal visits have 1.095 times more risk than regular visits with a range 0.779–1.539. Thus it can be concluded that antenatal visits are at risk of preeclampsia in primigravida mothers. Pregnancy examination or ANC (antenatal care) is an examination of pregnant women both physically and mentally. It saves mothers and children in pregnancy, childbirth, and puerperium to be healthy and normal postpartum, both physically and emotionally.<sup>16</sup>

Weight increase in 1–10 kg has a risk of 1.540 times, compared with an increase in body weight of 10–20 kg with a range 1.074–2.207. Thus it can be concluded that the increase in body weight risk for preeclampsia in primigravida mothers, and the value of  $p(0.000) < 0.005$  indicates that there is a relationship between BB increase and the incidence of preeclampsia in primigravida mothers.

Non-compliant ANC examination has a risk of 1.333 times, compared to compliant ANC examination with a range 0.970–1.831. Thus it can be concluded that the ANC examination is at risk of preeclampsia in primigravida mothers. ANC services affect preeclampsia incidence because ANC services are still not maximized provided to pregnant women. Routine ANC services include

**Table 3**  
Risk factors for preeclampsia in primigravida based on weight gain in BLUD Hospital. HMDjafar Harun and BLUD Hospital. Benjamin Guluh of Kolaka Regency.

	Preeclampsia				Total	(p) CI (OR)
	Case		Control			
	N	%	N	%		
<i>BB increment</i>						
1–10 kg	353	51.9	327	48.1	680	(0.018) 1.540 (1.074–2.207)
11–20 kg	61	41.2	87	58.8	148	
Total	414	100.0	414	100.0	828	
<i>ANC examination</i>						
Not obey	113	27.3	91	22.0	204	(0.076) 1.333 (0.970–1.831)
Obedient	301	72.7	323	78.0	624	
Total	414	100.0	414	100.0	828	
<i>HB examination</i>						
Anemia	331	80.0	338	81.6	669	(0.537) 0.897 (0.634–1.268)
No anemia	83	20.0	76	18.4	159	
Total	414	100.0	414	100.0	828	

Secondary data sources 2019.

**Table 4**  
Parameters of the become predictor antenatal care risk factor against genesis preeclampsia in primigravidae in BLUDs RS. HMDjafar Harun and BLUD Hospital. Benjamin Guluh of Kolaka Regency.

Variable	R <sup>2</sup>	Sig.	Exp(B)	95.0% CI for Exp(B)	
				Lower	Upper
Age	10.031	0.002	1.611	1.199	2.163
Incidence of hypertension in trimester 1	26.889	0.000	3.363	2.126	5.318
Antenatal visit	0.554	0.457	1.143	0.804	1.624
BB increment	6.100	0.014	1.594	1.101	2.308
ANC examination	1.742	0.187	1.245	0.899	1.725

at least four visits in each trimester (at least once in the first trimester, once in the second trimester, and twice in the third trimester of gestational age).<sup>17</sup>

Non-anemia has a risk of 0.879 times, compared to anemia with a range 0.634–1.268. Thus it can be concluded that HB examination is not at risk of preeclampsia in primigravida mothers. The average HB level of pregnant women is 10.72%. This level is lower than the average non-pregnant mother (11.47 g%). Pregnant women with low HB levels will cause some complications that will occur. Normal pregnancy results in a slight decrease in hemoglobin concentration due to hemodilution, a physiological adaptation in pregnancy. Therefore, hemoglobin concentration alone cannot be used to diagnose iron deficiency.<sup>18</sup> However, the hemoglobin concentration should be measured, even though not all anemia is caused by iron deficiency.<sup>19</sup>

## Conclusion

Based on the results and the discussion, it can be concluded that the variables maternal age, the incidence of hypertension in the first trimester, antenatal visits, added weight, and examination of pregnancy according to the standard of service antenatal care risky with the incidence of preeclampsia in primigravida in BLUDs RS. HM Djafar Harun and BLUD Benyamin Guluh Hospital in Kolaka Regency. Variables history of diabetes, multiple pregnancies, nutritional status, pregnancy examination, hemoglobin examination are not at risk with the incidence of preeclampsia in primigravida mothers at BLUD RS. HM Djafar Harun and BLUD Benyamin Guluh Hospital in Kolaka Regency. Variables that are significantly at risk with preeclampsia incidence in primigravida mothers based on

multivariate analysis are the hypertension history variable with OR value: 3.363 with a CI value of 2.126 and an upper value of 5.318.

## Conflict of interest

The authors declare no conflict of interest.

## References

- Ramos JGL, Sass N, Hofmeister S, et al. Preeclampsia – Resumo Definitions of Hypertensive States during Pregnancy Pathophysiological Foundations. *Rev Bras Ginecol e Obstet.* 2017;39:496–512. <http://dx.doi.org/10.1055/s-0037-1604471>.
- Yusuf H, Subih HS, Obeidat BS, et al. Associations between macro and micronutrients and antioxidants intakes with preeclampsia, results from a case-control study in Jordanian pregnant women. *Nutr Metab Cardiovasc Dis.* 2019;29:458–66. <http://dx.doi.org/10.1016/j.numecd.2019.01.008>.
- Osungbade KO, Ige OK. Public health perspectives of preeclampsia in developing countries: implication for health system strengthening; 2011. <http://dx.doi.org/10.1155/2011/481095>.
- Mol BWJ, Roberts CT, Thangaratinam S, et al. Pre-eclampsia. *Lancet.* 2016;387:999–1011. [http://dx.doi.org/10.1016/S0140-6736\(15\)00070-7](http://dx.doi.org/10.1016/S0140-6736(15)00070-7).
- Peres G, Mariana M, Cairrão E. Pre-eclampsia and eclampsia: an update on the pharmacological treatment applied in Portugal. *J Cardiovasc Dev Dis.* 2018;5:3. <http://dx.doi.org/10.3390/jcdd5010003>.
- Verma MK, Kapoor P, Yadav R, et al. Risk factor assessment for pre-eclampsia: a case control study. *Int J Med Public Health.* 2017;7:172–7.
- Endeshaw M, Abebe F, Bedimo M, et al. Family history of hypertension increases risk of preeclampsia in pregnant women: a case-control study. *Acta Obstet Gynecol Scand.* 2016;35:181–91. <http://dx.doi.org/10.18051/UnivMed.2016.v35.181-191>.
- Bodnar. Preeklampsia. Jakarta, Indonesia: Pustaka Sinar Harapan; 2015.
- Situmorang TH, Damantalm Y, Janurista A. FAKTOR – FAKTOR YANG BERHUBUNGAN DENGAN KEJADIAN RSU ANUTAPURA PALU. 2016;2:34–44.

10. Tessema. Pengaruh Preeklamsia Berat pada Kehamilan Terhadap Keluaran Maternal dan Perinatal di RSUP Dr. Kariadi Semarang Tahun 2010. Universitas Diponegoro; 2015.
11. Cunningham. Faktor Resiko Terjadinya Preeklampsiae. *J Kesehat Masy.* 2014;10:153–69.
12. Arisman MB. Gizi dalam daur kehidupan. Jakarta EGC. 2004:76–87.
13. Dollar. Desain dan Ukuran Sampel Untuk Penelitian Kuantitatif dan Kualitatif di Bidang Kesehatan. Yogyakarta: Gajah Mada University Pres; 2012.
14. Kiondo. Faktor-faktor Preeklampsia. *J Kesehat Masy.* 2012;78:98–102.
15. Roeshadi RH. Upaya menurunkan angka kesakitan dan angka kematian ibu pada penderita preeklampsia dan eklampsia. *Indones J Obstet Gynecol.* 2007.
16. Lincetto O, Mothebesoane-anoh S, Gomez P, et al. Antenatal care; 2012.
17. Kementerian Kesehatan Republik Indonesia. Buku Saku Pelayanan Kesehatan Ibu Di Fasilitas Kesehatan Dasar Dan Rujukan; 2013.
18. Sanghavi M, Rutherford JD, Chb MB. Cardiovascular management in pregnancy cardiovascular physiology of pregnancy; 2014. p. 1003–8, <http://dx.doi.org/10.1161/CIRCULATIONAHA.114.009029>.
19. WHO. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. World Health Organization; 2011.