Health Leadership and Quality of Life. 2025; 4:651
doi: 10.56294/hl2025651

ORIGINAL

Risk Factors for the Incidence of Preeclampsia among Pregnant Women of Bungi Health Center in Pinrang

Factores de riesgo para la incidencia de preeclampsia entre las mujeres embarazadas del Centro de Salud Bungi en Pinrang

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Cite as: Wijayanti E, Masni, Moedjiono AI, Mallongi A, Pratiwi SW, Stang, et al. Risk Factors for the Incidence of Preeclampsia among Pregnant Women of Bungi Health Center in Pinrang. Health Leadership and Quality of Life. 2025; 4:651. https://doi.org/10.56294/hl2025651

Submitted: 12-06-2024 **Revised:** 11-11-2024 **Accepted:** 09-04-2025 **Published:** 10-04-2025

Editor: PhD. Neela Satheesh

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ABSTRACT

Introduction: preeclampsia is one of the main causes of maternal death in Indonesia besides bleeding and infection. Preeclampsia is a condition where pregnant women with gestational age reaching 20 weeks have high blood pressure accompanied by proteinuria ≥+1.
Objective: to determine the magnitude of the risk of independent factors on the incidence of preeclampsia in pregnant women at the Bungi Health Center, Pinrang Regency.
Method: this study used a case-control study design with a total sample of 123 people (41 cases and 82 controls) selected with purposive sampling from pregnant women data at Bungi Health Center from January – December 2023. Data were analyzed univariate, Odds Ratio test and Logistic Regression.
Results: the results showed that variables that had significant risk factors for the incidence of preeclampsia were family history of disease (OR= 2,171; 95 % CI: 1,003–4,699), ANC history (OR= 2,262; 95 % CI: 1,048-4,879), history of hypertension (OR= 2,215; 95 % CI: 1,015-4,834), and frequency of classes for pregnant women (OR= 2,328; 95 % CI: 1,076-5,035). While variables that are not risk factors for the incidence of preeclampsia are education (OR = 0,406; 95 % CI: 0,186-0,884), parity (OR = 1,357; 95 % CI: 0,632-2,910), history of maternal disease (OR = 1,997; 95 % CI: 0,930-4,287), obesity (OR = 0,412; 95 % CI: 0,179-0,951) and pregnancy distance (OR = 0,434; 95 % CI: 0,195-0,967).
Conclusion: the results showed that significant risk factors for the incidence of preeclampsia based on bivariate analysis were: family history of disease, ANC history, history of hypertension and frequency of classes for pregnant women. While the results of multivariate analysis identified the most dominant risk factor for the incidence of preeclampsia, namely hypertension with OR = 38,620 (p = 0,003) it means that mothers with a history of hypertension have a greater risk of experiencing preeclampsia 38 620 times than pregnant women who do not have a history of hypertension, after being controlled by other variables such as education, family history of disease, obesity and class of pregnant women. These results emphasize the importance of early screening and strict monitoring of pregnant women with a history of hypertension, including preventive management and educational efforts from the preconception or early pre-conception.

Keywords: Preeclampsia; Pregnancy Hypertension; Education; Parity; History of Maternal Disease; Family History of Disease; ANC History; Obesity; Pregnancy Distance; Frequency of Classes for Pregnant Women.

RESUMEN

Introducción: la preeclampsia es una de las principales causas de mortalidad materna en Indonesia, junto con las hemorragias y las infecciones. La preeclampsia es una afección en la que las mujeres embarazadas con una edad gestacional de 20 semanas o más presentan hipertensión arterial acompañada de proteinuria ≥+1.
Objetivo: determinar la magnitud del riesgo de los factores independientes en la incidencia de la preeclampsia en mujeres embarazadas del Centro de Salud Bungi, en la regencia de Pinrang.
Método: este estudio utilizó un diseño de estudio de casos y controles con una muestra total de 123 personas (41 casos y 82 controles) seleccionadas mediante muestreo intencional a partir de los datos de mujeres embarazadas del Centro de Salud Bungi entre enero y diciembre de 2023. Los datos se analizaron mediante análisis univariante, prueba de odds ratio y regresión logística.
Resultados: los resultados mostraron que las variables que presentaban factores de riesgo significativos para la incidencia de preeclampsia eran los antecedentes familiares de la enfermedad (OR = 2,171; IC del 95 %: 1,003-4,699), los antecedentes de atención prenatal (OR = 2,262; IC del 95 %: 1,048-4,879), antecedentes de hipertensión (OR = 2,215; IC del 95 %: 1,015-4,834) y frecuencia de clases para mujeres embarazadas (OR = 2,328; IC del 95 %: 1,076-5,035). Mientras que las variables que no son factores de riesgo para la incidencia de preeclampsia son la educación (OR = 0,406; IC del 95 %: 0,186-0,884) , la paridad (OR = 1,357; IC del 95 %: 0,632-2,910), antecedentes de enfermedad materna (OR = 1,997; IC del 95 %: 0,930-4,287), la obesidad (OR = 0,412; IC del 95 %: 0,179-0,951) y la distancia entre embarazos (OR = 0,434; IC del 95 %: 0,195-0,967).
Conclusión: los resultados mostraron que los factores de riesgo significativos para la incidencia de preeclampsia según el análisis bivariado fueron: antecedentes familiares de la enfermedad, antecedentes de atención prenatal, antecedentes de hipertensión y frecuencia de clases para mujeres embarazadas. Mientras que los resultados del análisis multivariado identificaron el factor de riesgo más dominante para la incidencia de preeclampsia, a saber, la hipertensión con OR = 38,620 (p = 0,003), lo que significa que las madres con antecedentes de hipertensión tienen un riesgo 38 620 veces mayor de sufrir preeclampsia que las mujeres embarazadas que no tienen antecedentes de hipertensión, después de controlar otras variables como la educación, los antecedentes familiares de la enfermedad, la obesidad y las clases para mujeres embarazadas. Estos resultados enfatizan la importancia de la detección temprana y el seguimiento estricto de las mujeres embarazadas con antecedentes de hipertensión, incluyendo el manejo preventivo y los esfuerzos educativos desde antes de la concepción o en las primeras etapas de la misma.

Palabras clave: Preeclampsia; Hipertensión en el Embarazo; Educación; Paridad; Antecedentes de Enfermedades Maternas; Antecedentes Familiares de Enfermedades; Antecedentes de Atención Prenatal; Obesidad; Distancia entre Embarazos; Frecuencia de Clases para Mujeres Embarazadas.

INTRODUCTION

Preeclampsia is a condition in which pregnant women with a gestational age of 20 weeks have high blood pressure accompanied by proteinuria.[1] Preeclampsia is the onset of hypertension accompanied by proteinuria. Signs and symptoms of preeclampsia are dizziness, blurred vision, edema, systolic blood pressure of more than 160 mmHg and diastolic of more than 110 mmHg.[2] Mild preeclampsia syndrome with hypertension, edema and proteinuria is often not known or noticed by the woman concerned, so that without realizing it in a short time severe preeclampsia and even eclampsia can occur.

In fact, hypertension in pregnancy is the second largest cause of maternal death in the world (14 % of the total) and around 192 people die every day.[2] The causes of maternal death are caused by hypertension in pregnancy (preeclampsia/eclampsia), bleeding, infection, prolonged labor and unsafe abortion. Many factors increase the incidence of preeclampsia in pregnant women, these factors are influenced by the interaction between *host factors* (maternal age, parity, maternal history, family history, obesity, history of hypertension, pregnancy spacing), *agent factors (suspected to be caused by placental ischemia), and environmental* factors (race and ethnicity, socioeconomic).

Based on the 2019 Indonesian health profile data, hypertension in pregnancy is the leading cause of maternal death after bleeding with a total of 1 066 cases. The Maternal Mortality Rate (MMR) in Indonesia is still far from *the Sustainable Development Goals* (SDGs) target which has a target to reduce MMR to 70 per 100 000 live births in 2030.

According to [2] around 295 000 women died during and after pregnancy and childbirth in 2020 due to high blood pressure. In Indonesia, in 2019, the incidence of pregnant women experiencing hypertension was

recorded at 1,110 cases, and this figure dominated as a cause of maternal death, where throughout 2019 there were 4 221 deaths. According to the profile of the South Sulawesi Provincial Health Office in 2020, the number of maternal deaths in 2019 it was 144 people or 94,29 per 100 000 live births, namely Among the 41 pregnant women who died due to preeclampsia/eclampsia, it was ranked second with the most cases.

Early diagnosis of preeclampsia, which is the preliminary stage of eclampsia, and its treatment need to be carried out immediately to reduce maternal and child mortality rates. Therefore, good and thorough prenatal care can identify mothers who are at risk of developing problems in their pregnancy such as preeclampsia. Efforts made by health workers are to provide counseling to pregnant women who have risk factors for preeclampsia in the obstetrics polyclinic during antenatal care visits. Mothers who are younger <20 years old or older >35 years old must be prepared with various treatments, such as maternal health monitoring (routine ANC), sufficient health knowledge, improve diet and healthy lifestyle (regular exercise, adequate rest, weight control, and avoid stress). In addition, pregnant women diagnosed with severe preeclampsia will be given immediate treatment by a doctor with the recommendation that pregnant women must comply with the treatment (take medication as directed by the doctor). Compliance with treatment in preeclampsia patients is very important because it helps regulate and manage blood pressure levels. In these conditions, it can reduce long-term damage to vital organs such as the heart, brain, and kidneys.[3]

Pregnant women with various complications in pregnancy such as preeclampsia, due to the interaction between host factors such as age, parity, maternal medical history, family medical history, weight gain, pregnancy spacing and history of hypertension, agent factors suspected of being due to placental ischemia, and environmental factors such as the residential environment including ANC visits, education, work and low maternal income will increase the risk of preeclampsia in pregnant women. This is in line with Septiasih's[4] which states that every pregnancy, in its development, has a risk of experiencing complications. Thus, the government provides quality *antenatal care services* which include early detection examinations for the risk of complications.

Based on the theory, data and research results that have been described, the problem that will be studied further in this study is the risk factors for the occurrence of preeclampsia in pregnant women, the purpose of this study is to determine the magnitude of the risk of independent factors for the occurrence of preeclampsia in pregnant women at the Bungi Health Center, Pinrang Regency in 2023.

METHOD

Location and Research Design

This study was conducted in the Bungi Health Center Working Area, Duampanua District, Pinrang Regency from December 2024 to February 2025. The type of research used was observational analytic with a case control study design.

Population and sample

The population in this study were all pregnant women in the Bungi Health Center Working Area, Duampanua District, Pinrang Regency, which was calculated from January to December 2023, namely 184 people. The sample in this study were pregnant women who met the inclusion and exclusion criteria, namely 123 pregnant women who were selected by *non-probability sampling* with a *purposive sampling type*, with a ratio of 1: 2 where the case group was 41 respondents and the control group was 82 respondents.

Method of collecting data

The data used in this study are secondary data obtained from medical records of pregnant women, village midwife report books and report books of pregnant women's visits at the Bungi Health Center, Pinrang Regency in 2023.

Data analysis

Data processing using SPSS assistance. To determine the distribution and percentage of each independent variable using a bar graph. To determine the magnitude of the risk of independent factors on the incidence of preeclampsia using the *Odds Ratio* (OR) test. Furthermore, to determine the most dominant risk factors for the incidence of preeclampsia using multiple logistic regression tests.

RESULTS

Univariate analysis

Univariate analysis explains the distribution of risk factors for preeclampsia in pregnant women at the Bungi Health Center in 2023. The results of the analysis are presented in the form of a diagram as follows:

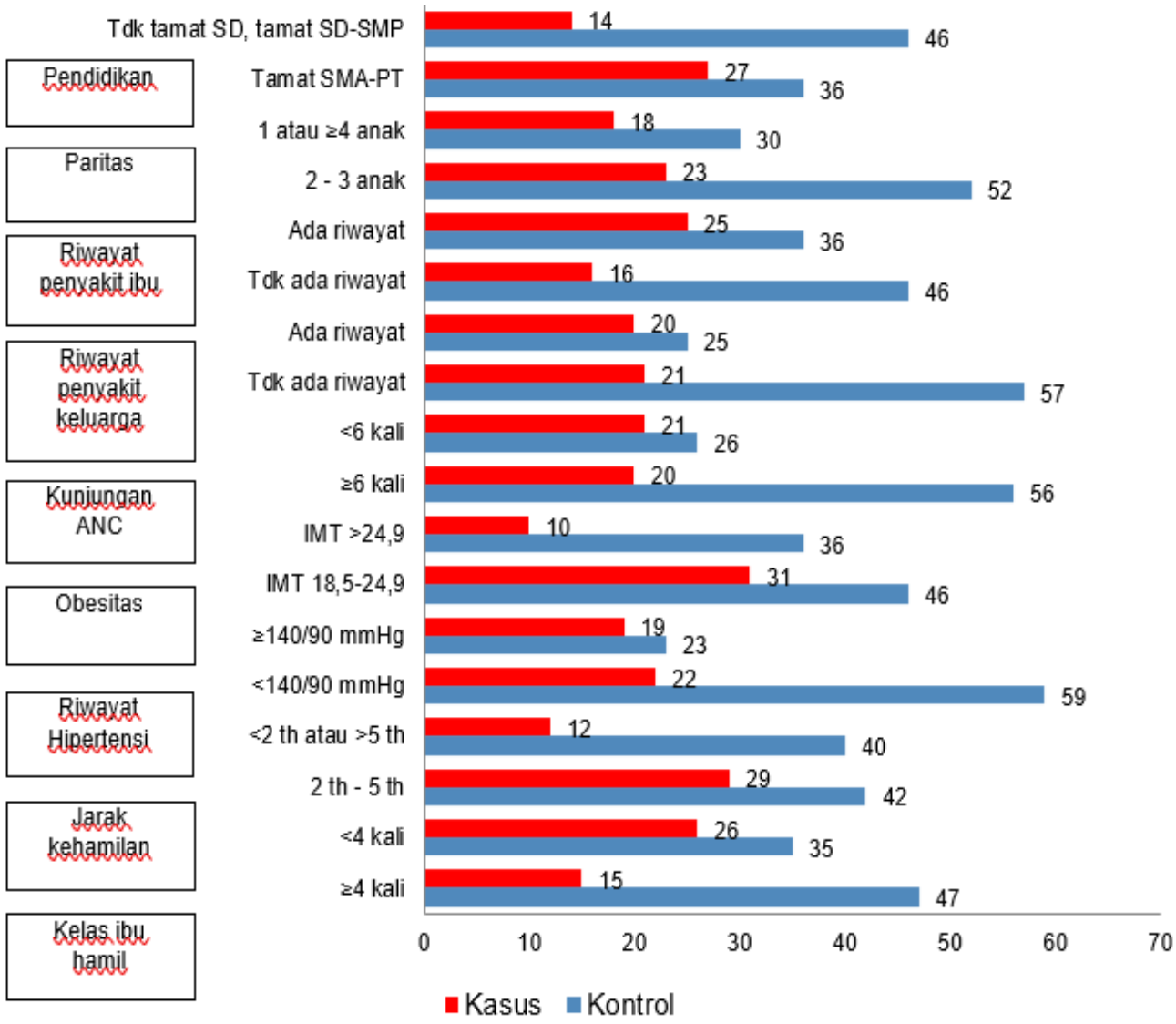

Figure 1. Risk Factors for Preeclampsia in Pregnant Women at the Community Health Center

Pinrang Regency Flower 2023

Based on figure 1, it shows that the proportion of pregnant women with low education status is higher in the control group 46 (56,1 %) people compared to the case group which is 14 (34,1 %) people. Meanwhile, based on parity, mothers with parity 1 or >4 in the case group are 18 (43,9 %) people while the control group is 30 (36,6 %) people. In terms of maternal medical history in the case group, there are 25 (61,0 %) people, while the control group is 36 (43,9 %) people. This shows that the presence of previous diseases contributes to an increased risk of preeclampsia. Likewise, family medical history in the case group is 20 (48,8 %) people while the control group is 25 (30,5 %), which indicates a genetic factor that plays a role in the occurrence of preeclampsia.

In addition, the number of visits to health facilities also appeared different, pregnant women who had a number of visits <6 times during pregnancy in the case group were 21 (51,2 %) compared to the control group of 26 (31,7 %). Obesity also showed that mothers who had a BMI> 24,9 were more in the control group, namely 36 (43,9 %) people compared to the case group, namely 10 (24,4 %) people. Furthermore, blood pressure, pregnant women who had blood pressure ≥ 140/90 mmHg were more in the control group, namely 23 (28,0 %) people compared to the case group, namely 19 (46,3 %) people. The previous pregnancy interval showed that mothers with a pregnancy interval of <2 years or > 5 years in the case group were 12 (29,3 %) people while the control group was 40 (48,8 %) people. Based on the frequency of pregnancy classes, the participation of mothers in attending pregnancy classes in the case group was 26 (63,4 %) while in the control group it was 35 (42,7 %) people.

Bivariate analysis

Bivariate analysis is an analysis conducted to determine the magnitude of the risk of independent variables on the occurrence of preeclampsia using the *Odds Ratio* (OR) test. The results of the analysis can be seen in

the following table:

Table 1. Proportion of Preeclampsia and Non-Preeclampsia Incidents Based on Maternal Education at Bungi Health Center Pinrang Regency in 2023

Education	Preeclampsia Occurrence				OR	(95 % CI) LL-UL
	Case		Control			
	n	%	n	%		
At risk	14	34,1	46	56,1	0,406	0,186-0,884
No Risk	27	65,9	36	43,9		
Total	41	100,0	82	100,0		

Table 1 shows that the proportion of pregnant women with low education was higher in the control group 56,1 % compared to the case group 34,1 %, the results of the statistical test obtained an OR value = 0,406 (95 % CI: 0,186-0,884) which means that education is not a risk factor for the occurrence of preeclampsia.

Table 2. Proportion of Preeclampsia and Non-Preeclampsia Incidents Based on Maternal Parity at Bungi Health Center Pinrang Regency in 2023

Parity	Preeclampsia Occurrence				OR	(95 % CI) LL-UL
	Case		Control			
	n	%	n	%		
At risk	18	43,9	30	36,6	1,357	0,632-2,910
No Risk	23	56,1	52	63,4		
Total	41	100,0	82	100,0		

Table 2 shows that the proportion of pregnant women with parity of 1 or ≥4 children was higher in the case group 43,9 % compared to the control group 36,6 %, the results of the statistical test obtained an OR value = 1,357 (95 % CI: 0,632-2,910) which means that parity is not a risk factor for the occurrence of preeclampsia.

Table 3. Proportion of Preeclampsia and Non-Preeclampsia Incidents Based on Maternal Medical History at Bungi Health Center Pinrang Regency in 2023

Maternal Medical History	Preeclampsia Occurrence				OR	(95 % CI) LL-UL
	Case		Control			
	n	%	n	%		
At risk	25	61,0	36	43,9	1,997	0,930-4,287
No Risk	16	39,0	46	56,1		
Total	41	100,0	82	100,0		

Table 3 shows that the proportion of pregnant women with a history of previous illness was higher in the case group (61,0 %) compared to the control group (43,9 %). The results of the statistical test obtained an OR value of 1,997 (95 % CI: 0,930-4,287), which means that the mother's medical history is not a risk factor for the occurrence of preeclampsia.

Table 4. Proportion of Preeclampsia and Non-Preeclampsia Incidents Based on Family Disease History at Bungi Health Center Pinrang Regency in 2023

Family Medical History	Preeclampsia Occurrence				OR	(95 % CI) LL-UL
	Case		Control			
	n	%	n	%		
At risk	20	48,8	25	30,5	2,171	1,003-4,699
No Risk	21	51,2	57	69,5		
Total	41	100,0	82	100,0		

Table 4 shows that the proportion of pregnant women with a family history of disease is higher in the case group 48,8 % compared to the control group 30,5 %, the results of the statistical test obtained an OR value of 2,171 (95 % CI: 1,003–4,699) which means that a family history of disease is a significant risk factor for the occurrence of preeclampsia. This means that pregnant women with a family history of disease are 2,171 times

more at risk of experiencing preeclampsia than mothers who do not have a family history of disease.

Table 5. Proportion of Preeclampsia and Non-Preeclampsia Incidents Based on ANC History at Bungi Health Center Pinrang Regency in 2023

ANC History	Preeclampsia Occurrence				OR	(95 % CI) LL-UL
	Case		Control			
	n	%	n	%		
At risk	21	51,2	26	31,7	2,262	1,048-4,879
No Risk	20	48,8	56	68,3		
Total	41	100,0	82	100,0		

Table 5 shows that the proportion of pregnant women with a history of ANC <6 visits (trimester I, II, and III) is higher in the case group, namely 51,2 % compared to the control group, namely 31,7 %, the results of the statistical test obtained an OR value = 2,262 (95 % CI: 1,048-4,879) which means that ANC history is a significant risk factor for the occurrence of preeclampsia. This means that pregnant women with a history of ANC visits <6 times have a 2,262 times greater risk of experiencing preeclampsia than mothers who have a history of ANC visits ≥6 times.

Table 6. Proportion of Preeclampsia and Non-Preeclampsia Incidents Based on Obesity at Bungi Health Center Pinrang Regency in 2023

Obesity	Preeclampsia Occurrence				OR	(95 % CI) LL-UL
	Case		Control			
	n	%	n	%		
At risk	10	24,4	36	43,9	0,412	0,179-0,951
No Risk	31	75,6	46	56,1		
Total	41	100,0	82	100,0		

Table 6 shows that the proportion of pregnant women with obesity (BMI >24,9) is higher in the control group, namely 43,9 % compared to the case group, namely 24,4 %. The results of the statistical test obtained an OR value of 0,412 (95 % CI: 0,179-0,951) which means that obesity is not a risk factor for the occurrence of preeclampsia.

Table 7. Proportion of Preeclampsia and Non-Preeclampsia Incidents Based on Maternal Hypertension History at Bungi Health Center Pinrang Regency in 2023

History of Hypertension	Preeclampsia Occurrence				OR	(95 % CI) LL-UL
	Case		Control			
	n	%	n	%		
At risk	19	46,3	23	28,0	2,215	1,015-4,834
No Risk	22	53,7	59	72,0		
Total	41	100,0	82	100,0		

Table 7 shows that the proportion of pregnant women with a history of hypertension (≥140/90 mmHg) is greater in the case group 46,3 % compared to the control group 28,0 %, the statistical test results obtained an OR value of 2,215 (95 % CI: 1,015–4,834) which means that History of hypertension is a significant risk factor for the occurrence of preeclampsia. This means that mothers with a history of hypertension have a 2,215 times greater risk of experiencing preeclampsia than mothers who do not have a history of hypertension.

Table 8. Proportion of Preeclampsia and Non-Preeclampsia Incidents Based on Maternal Pregnancy Interval at Bungi Health Center Pinrang Regency in 2023

Pregnancy Spacing	Preeclampsia Occurrence				OR	(95 % CI) LL-UL
	Case		Control			
	n	%	n	%		
At risk	12	29,3	40	48,8	0,434	0,195-0,967
No Risk	29	70,7	42	51,2		
Total	41	100,0	82	100,0		

Table 8 shows that the proportion of pregnant women with pregnancy intervals (<2 years or >5 years) was higher in the control group, namely 48,8 % compared to the case group, namely 29,3 %. The results of the statistical test obtained an OR value of 0,434 (95 % CI: 0,195-0,967), which means that pregnancy intervals are not a risk factor for the occurrence of preeclampsia.

Table 9. Proportion of Preeclampsia and Non-Preeclampsia Incidents Based on the Frequency of Pregnant Women's Classes at Bungi Health Center Pinrang Regency in 2023

Frequency of Pregnant Women's Classes	Preeclampsia Occurrence				OR	(95 % CI) LL-UL
	Case		Control			
	n	%	n	%		
At risk	26	63,4	35	42,7	2,328	1,076-5,035
No Risk	15	36,6	47	57,3		
Total	41	100,0	82	100,0		

Table 9 shows that the proportion of pregnant women with a frequency of pregnancy classes (<4 times) is higher in the case group, namely 63,4 % compared to the control group, namely 42,7 %, the results of the statistical test obtained an OR value = 2,328 (95 % CI: 1,076–5,035) which means that the frequency of pregnancy classes is a significant risk factor for the occurrence of preeclampsia. This means that pregnant women who rarely attend pregnancy classes have a 2,328 times greater risk of experiencing preeclampsia than pregnant women who regularly attend pregnancy classes.

Multivariate analysis

Multivariate analysis was conducted to determine which risk factors were the most dominant risk factors for preeclampsia using multiple logistic regression tests identified through *p-value* <0,05 and *Odds Ratio* (OR). The results of the analysis can be seen in the following table:

Table 10. Results of Multivariate Analysis Using Multiple Logistic Regression Test

Variables in the Equation		B	SE	Wald	df	Sig.	Exp(B)
Step 3	EducationKat	1,376	0,541	6,478	1	0,011	3,961
	Family Disease	-3,079	0,928	11,007	1	0,001	0,046
	Obesity	-2,536	1,231	4,246	1	0,039	0,079
	History of Hypertension	3,654	1,215	9,049	1	0,003	38,620
	Pregnant Mother Class	3,057	0,913	11,202	1	0,001	21,273
	Constant	-4,876	1,695	8,272	1	0,004	0,008

Based on the results of the multivariate analysis, the variable that has the most dominant risk factor for the occurrence of preeclampsia is a history of hypertension, the results of the statistical test obtained an OR value of 38,620. (*p-value* 0,003) means that pregnant women with a history of hypertension have a 38,620 times greater risk of experiencing preeclampsia compared to pregnant women who do not have a history of hypertension, after being controlled by other variables such as education, family history of disease, obesity and class of pregnant women.

DISCUSSION

Preeclampsia is one of the main causes of maternal death in Indonesia besides bleeding and infection. Preeclampsia is hypertension that occurs after 20 weeks of pregnancy accompanied by proteinuria or signs of kidney disorders, pulmonary edema, liver disorders, thrombocytopenia and neurological symptoms. Hypertensive disease in pregnancy is the second most common cause of perinatal morbidity and mortality.[5] Based on the research results, it can be clearly described as follows:

Education

Education is associated with a person's awareness of the importance of healthy living behavior. A person's level of education affects how a person makes decisions about the health problems they experience. The results of the bivariate analysis showed an OR value of 0,406 (95 % CI: 0,186-0,884) which means that mothers with low education are not a risk factor for the occurrence of preeclampsia. While the results of the multivariate test obtained an OR value of 3,961 (p = 0,011) indicating that mothers with low education have a 3,961

times greater risk of experiencing preeclampsia than mothers with high education. However, this is inversely proportional to the previous bivariate results, indicating that after being controlled with other variables, low education becomes a strong risk factor. This is in line with the research of [6] the results of the statistical test obtained an OR value of 3,753 (95 % CI: 1,440-9,779) which means that mothers with low education have a 3,753 times greater risk of experiencing preeclampsia than mothers with higher education, so education is a risk factor for the occurrence of preeclampsia.

Parity

Primigravida and grandemultigravida have a greater risk of hypertension in pregnancy when compared to multigravida, namely the number of parities 2-3 times. The results of the analysis showed that parity had an OR value = 1,357 (95 % CI: 0,632-2,910), which means that parity is not a risk factor for the occurrence of preeclampsia. This is in line with [6] which stated that the results of the statistical test obtained an OR value = 1,450 (95 % CI: 0,544-3,862) *p* = 0,619 which means that parity is not a risk factor for the occurrence of preeclampsia.

Maternal medical history

Pregnant women who have a history of previous diseases such as preeclampsia, a history of diabetes mellitus, and kidney disease during pregnancy have a greater risk of experiencing severe preeclampsia, early onset preeclampsia and poor perinatal outcomes compared to mothers who do not have a history of the disease. The results of the analysis showed that the mother's medical history had an OR value = 1,997 (95 % CI: 0,930-4,287), which means that the mother's medical history is not a risk factor for the occurrence of preeclampsia. This is in line with Wulandari's[7] research which stated that the mother's medical history is not a risk factor for the occurrence of preeclampsia, where the results of the statistical test obtained an OR value = 0,651 (95 % CI: 0,199-2,123). It should be considered that the genetic response in each individual is not the same so that there is a possibility that mothers who have a history of the disease (preeclampsia, kidney failure) or do not have a history of the disease, do not experience preeclampsia in their current pregnancy. So every pregnant woman basically has the possibility of experiencing preeclampsia because of various factors that influence each other.

Family Medical History

Preeclampsia has a complex etiology, which is the result of the relationship between genetic disorders, immunological factors, and the placenta. Pregnant women whose mothers have experienced preeclampsia tend to be at risk of preeclampsia. The results of the bivariate analysis showed that family history of the disease had an OR value of 2,171 (95 % CI: 1,003-4,699), which means that mothers with a family history of the disease have a 2,171 times risk of experiencing preeclampsia compared to mothers without such a history. Meanwhile, the results of the multivariate test obtained an OR value of 0,096 (p = 0,021) which means that pregnant women who have genetic factors and family predisposition can increase the risk of preeclampsia due to the involvement of the immune system and inherited vascular regulation. This is in line with Wardani's[8] research where a significant correlation was found between family history of disease and the incidence of preeclampsia with an OR value of 17,907, which means that family history of disease is a risk factor for the incidence of preeclampsia. This means that pregnant women with a history of disease in the family have a 17,907 times greater risk of experiencing preeclampsia than mothers who do not have a family history of disease.

ANC History

Antenatal Care (ANC) is an examination conducted during pregnancy to maximize the mother's health mentally and physically in facing childbirth, and can identify complications during pregnancy. The results of the analysis obtained an OR value of 2,262 (95 % CI: 1,048-4,879) which means that a history of ANC visits is a risk factor for the occurrence of preeclampsia. This means that pregnant women with a history of ANC visits <6 times, are 2,262 times more at risk of experiencing preeclampsia than mothers who have a history of ANC visits ≥6 times. This is in line with Anggraeny's[8] research where the results of the statistical test obtained an OR value of 11,702 (95 % CI: 4,476-30,595), which means that pregnant women with a history of ANC visits <6 times have a 11,702 times greater risk of experiencing preeclampsia compared to mothers who have a history of ANC visits ≥6 times.[9]

Obesity

According to the Ministry of Health of the Republic of Indonesia in 2021, pregnant women with a BMI > 25 kg/m2 [are] included in the obesity category. Pregnant women with excess weight can cause bleeding and pre-eclampsia. The results of the bivariate analysis obtained an OR value = 0,412 (95 % CI: 0,179-0,951) which means that obesity is not a risk factor for the occurrence of preeclampsia. Meanwhile, the results of the multivariate test obtained an OR value = 0,079 (p = 0,039) meaning that pregnant women who are obese can increase the

risk of preeclampsia. However, this result is inversely proportional to the previous bivariate results, indicating that after being controlled with other variables, obesity becomes a strong risk factor. This is in line with Hamzah's[10] research which states that the results of the statistical test obtained an OR value = 0,859 (95 % CI: 0,610-1,209) which means that obesity is not a risk factor for the occurrence of preeclampsia. However, the higher the Body Mass Index (BMI), the higher the risk of pregnancy complications including preeclampsia, gestational hypertension and gestational diabetes.

History of Hypertension

Hypertension that already exists before pregnancy will become more severe with pregnancy and can even be accompanied by edema and proteinuria. This is because hypertension suffered before pregnancy has caused disorders/damage to important organs of the body, so that it can cause more severe disorders/damage. The results of the bivariate analysis obtained an OR value of 2,215 (95 % CI: 1,015-4,834), which means that a history of hypertension is a risk factor for the occurrence of preeclampsia. This means that pregnant women with a history of hypertension have a 2,215 times greater risk of experiencing preeclampsia compared to mothers without a history of hypertension. While the results of the multivariate test obtained a value of OR = 38,620 (p = 0,003) means that mothers with a history of hypertension have a 38,620 times greater risk of experiencing preeclampsia than mothers who do not have a history of hypertension. This is in line with Irawati's[11] study which found a significant correlation between a history of hypertension and the incidence of preeclampsia, the results of the statistical test obtained an OR value of 2,875 (95 % CI: 1,234-6,700) which means that mothers who have a history of hypertension have a 2,875 times greater risk of experiencing preeclampsia compared to pregnant women who do not have a history of hypertension. These results emphasize the importance of early screening and close monitoring of pregnant women with a history of hypertension, including preventive management efforts and education from the preconception period to early pregnancy.

Previous Pregnancy Distance

Pregnancy interval is the time span between the current pregnancy and the previous pregnancy. According to the World Health Organization (WHO), the recommended birth interval is 33 months or 2-5 years after the previous birth. The results of the analysis showed that pregnancy interval had an OR value = 0,434 (95 % CI: 0,195-0,967) which means that the previous pregnancy interval is not a risk factor for the occurrence of preeclampsia. This is in line with the research of Pattipeilohy[12] where the results of the statistical test obtained an OR value = 0,509 (95 % CI: 0,165-1,570) meaning that the previous pregnancy interval is not a risk factor for the occurrence of preeclampsia. This shows that mothers with a high-risk pregnancy interval make pregnant women susceptible to psychological stress which then leads to preeclampsia.[13,14]

Frequency of Pregnant Women's Classes

Based on the regulations of the Indonesian Ministry of Health, 2022 in the posyandu cadre book for pregnant women classes, it is recommended to attend pregnant women classes at least 4 times during pregnancy, attended by the husband or family. The results of the bivariate analysis obtained an OR value of 2,328 (95 % CI: 1,076-5,035) which means that the frequency of pregnant women classes is a risk factor for the occurrence of preeclampsia. This means that pregnant women who rarely attend pregnant women classes have a 2,328 times greater risk of experiencing preeclampsia than those who regularly attend pregnant women classes. While the results of the multivariate test obtained a value OR = 21,273 (p = 0,001) means that pregnant women who rarely attend pregnancy classes have a 21,273 times greater risk of experiencing preeclampsia than mothers who regularly attend pregnancy classes. This is different from the results of Putri's[15] study which stated that pregnant women who participated in pregnancy classes were only 32,5 %, which did not reach the 50 % target participants. These results emphasize the importance of education during pregnancy through pregnancy classes which have been shown to play an important role in preventing preeclampsia.

CONCLUSION

Based on the results of the study on risk factors for the occurrence of preeclampsia in pregnant women at the Bungi Health Center, Pinrang Regency in 2023, it can be concluded that the variables that have significant risk factors for the occurrence of preeclampsia based on bivariate analysis are family history of disease (OR = 2,171; 95 % CI: 1,003–4,699) , history of ANC (OR = 2,262; 95 % CI: 1,048-4,879) , history of hypertension (OR = 2,215; 95 % CI: 1,015–4,834) and frequency of pregnant women's classes (OR = 2,328; 95 % CI: 1,076–5,035). While the variables that are not significant risk factors for the occurrence of preeclampsia are education, parity, maternal disease history, obesity and pregnancy spacing. The results of the multivariate analysis identified the most dominant risk factor for the occurrence of preeclampsia, namely a history of hypertension with OR = 38,620 (p = 0,003) meaning that pregnant women with a history of hypertension have a 38,620 times greater risk of experiencing preeclampsia than pregnant women who do not have a history of hypertension. Therefore, after

being controlled by other variables such as education, family history of disease, obesity and class of pregnant women, a history of hypertension remains the dominant risk factor. These results emphasize the importance of early screening and close monitoring of pregnant women with a history of hypertension, including preventive management efforts and education from the preconception period to early pregnancy.

Suggestion

- For Health Workers:
  - It is necessary to actively screen pregnant women for a history of hypertension and family disease from the beginning of pregnancy.
  - Increase nutritional monitoring and education for pregnant women with obesity to prevent pregnancy complications.
  - Increase the frequency and quality of prenatal classes as an important educational medium for preventing preeclampsia.
- For Pregnant Women:
  - It is recommended to attend pregnancy classes regularly to gain sufficient knowledge about pregnancy danger signs, including preeclampsia.
  - Implement a healthy lifestyle and have regular pregnancy check-ups (ANC) according to schedule.
- For Health Centers and Local Governments:
  - It is necessary to develop integrated promotive and preventive programs, especially for assisting high-risk pregnant women.
  - Integrating hypertension and obesity control programs with maternal health services.

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FINANCING

The authors did not receive financing for the development of this research

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest

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