Health Dynamics
eISSN: 3006-5518
Publisher: Knowledge Dynamics
DOI: https://doi.org/10.33846/hd202s11

Original Research

Analysis of Preeclampsia Risk Factors at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regency Hospital, Indonesia

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Article history
Received: 30 October 2024
Revised: 17 February 2025
Accepted: 18 February 2025
Published Online: 20 February 2025

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How to cite this article: Rahayu AT, Triyawati L, Wahyuni S. Analysis of Preeclampsia Risk Factors at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regency Hospital, Indonesia. Health Dynamics, 2025, 2(2s), 76-85. https://doi.org/10.33846/hd202s11

ABSTRACT

Background: Hypertension in pregnancy affects 10% of pregnant women worldwide and includes preeclampsia, eclampsia, gestational hypertension, and chronic hypertension. Preeclampsia is the most common, with a global incidence of 2–8% of pregnancies. In Indonesia, preeclampsia accounts for 128,273 cases annually, or approximately 5.3% of pregnancies. Several risk factors contribute to preeclampsia, including a history of preeclampsia, diabetes, chronic hypertension, kidney disorders, a family history of severe preeclampsia, obesity, maternal age, nulliparity, and multiple pregnancies. Medical records from Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regency Hospital show that preeclampsia cases constituted 17.57% (195 of 1,110 cases) in 2020 and 8.26% (139 of 1,696 cases) in 2021. This study aims to analyze the risk factors for preeclampsia at RSUD Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regency. **Methods:** This observational analytic study employed a cross-sectional design. The sample consisted of 105 pregnant women in their second and third trimesters, selected using simple random sampling. Data were analyzed using the Multiple Logistic Regression Test to assess risk factors. **Results:** The multivariate analysis yielded a significance value of 0.243, indicating that maternal age, history of preeclampsia, and pregnancy spacing influence preeclampsia incidence. The Model Summary table showed Nagelkerke's R Square value of 0.037. **Conclusion:** Maternal age, pregnancy spacing, and a history of preeclampsia are significant risk factors for preeclampsia.

Keywords: Pregnant women; risk factor; preeclampsia

1. INTRODUCTION

Maternal and child health is one of the concerns of the World Health Organization (WHO) because mothers are an important component in the development of every nation to prepare a good quality-generation in the future.(1) The Maternal Mortality Rate (MMR) in Indonesia is still high, one of the causes is pregnant women with preeclampsia. Preeclampsia is one of the main causes of death of pregnant women, fetuses, and neonates, especially in low- and middle-income countries. The prevalence of preeclampsia is related to various risk factors. These risk factors include a history of previous preeclampsia, diabetes, pregestational, chronic hypertension, kidney disorders, having a close family with a history of severe preeclampsia, being overweight or obese before pregnancy, age, nulliparity and twins.(2) Preeclampsia often occurs in the early reproductive period <20 years and the end of the reproductive period >35 years.(3)

There are 36 Public Health Centers in Bojonegoro. According to the Bojonegoro Regency health profile data, it was found that the coverage of Maternal and Child Health service indicators in the last three years showed that the

performance of KIA at the Bojonegoro Regency Health Office was still low where the Maternal Mortality Rate (MMR) trended upwards, in 2020 it reached 161.80 per 100,000 live births. The number of maternal deaths was 28 people spread across 21 health centers. The direct causes of maternal death were other causes of 42.86% (12 cases) and bleeding 28.57% (8 cases), hypertension in pregnancy 23.43% (6 cases) and circulatory system disorders 7.14% (2 cases).[4] While in 2021 it reached 200.30 per 100,000 live births. The number of maternal deaths in 2021 was 33 people spread across 21 Health Centers. The direct causes of maternal deaths in 2021 were other causes of 66.67% (22 cases) and bleeding 15.15% (5 cases), hypertension in pregnancy 9.09% (3 cases) and circulatory system disorders 9.09% (3 cases). Based on medical record data from Dr. R. Sosodoro Djatikoesoemo Bojonegoro Hospital in 2020 there were 17.57% of the total cases of 1110 (195 cases) of Preeclampsia, and in 2021 there were 8.26% of the total cases of 1696 (139 cases) of Preeclampsia. In 2020, there were 5.88% (1 case) of pregnant women dying due to Preeclampsia. Meanwhile, the number of maternal deaths caused by eclampsia in 2021 was 4.25% (2 cases) of maternal deaths.[5]

Based on the data above, the high number of preeclampsia cases each year and the increasing number of maternal deaths due to preeclampsia, the researcher is interested in conducting research on the analysis of preeclampsia incident risk factors at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regency Hospital. The objects of this research were pregnant women in the second and third trimesters.

2. METHODS

2.1 Study design

This study employed an observational analytic approach using a cross-sectional design. The research was conducted at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regency Hospital from February to July 2024. The study population consisted of all pregnant women in their second and third trimesters who attended the hospital during the study period.

A simple random sampling method was used to select 105 pregnant women who met the inclusion criteria. The dependent variables included maternal age, education, gestational age, parity, pregnancy spacing, history of preeclampsia, and history of diabetes mellitus. The independent variable was the incidence of preeclampsia.

2.2 Data Collection and Instruments

Data were collected using a structured questionnaire administered through face-to-face interviews with respondents. Additional clinical and obstetric information was obtained from medical records to ensure accuracy. The questionnaire was pre-tested to assess validity and reliability before full implementation.

2.3 Data Analysis

The collected data were analyzed using the Multiple Logistic Regression Test to determine associations between risk factors and the incidence of preeclampsia. Statistical significance was set at $p < 0.05$, and results were reported with adjusted odds ratios (AORs) and 95% confidence intervals (CIs).

2.4 Ethical Considerations

This study received ethical exemption from the Ethics Committee of Poltekkes Kemenkes Surabaya (Approval No. EA/2450/KEPK-Poltekkes_Sby/V/2024). All participants provided written informed consent before participation. Confidentiality and anonymity were maintained throughout the study, and respondents had the right to withdraw at any time without consequences.

3. RESULTS

3.1 Univariate Analysis

Univariate analysis is an analysis that produces frequency and percentage distributions of each research variable, including independent variables (maternal age, education, gestational age, parity, spacing, history of preeclampsia and history of diabetes mellitus) and dependent variables (incidence of preeclampsia).

Based on Table 1, it shows that out of 105 respondents, the majority are in the age range of 20-35 years (76.20%). For educational status, most of the respondents have secondary education (52.40%). For gestational age, most of the respondents are pregnant at term (53.30%). For parity, most of the respondents are multiparous (56.20%). For spacing, most are between 2-10 years (59.00%). For History of Preeclampsia, most of the respondents have no history of preeclampsia (86.70%). For history of Diabetes mellitus, most of the

respondents do not have a history of diabetes mellitus (93.30%) and for the occurrence of preeclampsia, most of the respondents do not experience preeclampsia (59.00%).

Table 1. Distribution of independent variables (maternal age, education, gestational age, parity, spacing, history of preeclampsia and history of diabetes mellitus) and dependent variables (incidence of preeclampsia) at dr. R. Sosodoro Djatikoesoemo Bojonegoro Regency Hospital in 2024 (n = 105)

Variable	Category	Frequency	Percentage
Age	<20 - > 35 years old	25	23.80
	≥20 - ≤ 35 years old	80	76.20
Education	Uneducated	1	1.00
	Elementary school	40	38.10
	Junior high school	55	52.40
	Senior high school	9	8.60
Pregnancy Age	Preterm	49	46.70
	Aterm	56	53.30
Paritas	Primipara	42	40.00
	Multipara	59	56.20
	Grandemultipara	4	3.80
Pregnancy Spacing	< 2 - >10 year	62	59.00
	2 – 10 years	43	41.00
Preeclampsia History	Yes	14	13.30
	No	91	86.70
Diabetes melitus history	Yes	7	6.70
	No	98	93.30
Preeclampsia incident	Yes	43	41.00
	No	62	59.00

3.2 Bivariate Analysis

The influence of maternal risk factors (maternal age, education, gestational age, parity, spacing, history of preeclampsia and history of diabetes mellitus) on the incidence of preeclampsia.

Based on Table 2 shows that respondents with age <20 - > 35 years old experienced Preeclampsia 60.0%. While the age of pregnant women ≥20 - ≤ 35 years old mostly did not experience preeclampsia in pregnancy by 65.0%. The results of the Chi Square Statistical test obtained p <α (0.026) with a value of Coefficient Contingency I = 0.036, so H0 was rejected, which means there is an effect of the age of pregnant women with the incidence of preeclampsia in pregnancy at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Hospital with a strong level of closeness. For the education variable, most pregnant women have secondary education of 52.4%. Both mothers with no education, basic education, secondary education and higher education mostly do not experience preeclampsia in Pregnancy. The results of the Chi Square statistical test obtained 0.637> α (0.05), so H0 is accepted, which means that the education of pregnant women does not influence the incidence of preeclampsia in pregnancy at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regional Hospital. For the gestational age variable, it shows that pregnant women with preterm gestational age 55.1% do not experience preeclampsia in pregnancy while pregnant women with aterm gestational age as much as 62.5% also do not experience preeclampsia in pregnancy. The results of the Chi Square statistical test obtained 0.442> α (0.05) with a Contingency Coefficient I value = 0.551, so H0 is accepted, which means that there is no effect of the gestational age of pregnant women on the incidence of preeclampsia in pregnancy at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regency Hospital.

For the parity variable, the results showed that primiparous respondents did not experience preeclampsia in pregnancy, which was 57.1 /%, multiparous respondents did not experience preeclampsia in pregnancy, which was 57.6%, and

Table 2. Results of bivariate analysis of maternal risk factors on the incidence of preeclampsia in 2024 (n=105)

Pregnant mother risk factors	Preeclamsia incident				p-value	OR
	Without preeklamsia		Preeclamsia			
	n	%	n	%		
Mother's age					0.026	0.036
<20 - > 35 years old	10	40.0	15	60.0		
≥20 - ≤ 35 years old	52	65.0	28	35.0		
Education					0.637	0.630
Uneducated	1	100.0	0	0,0		
Elementary school	24	60.0	16	40.0		
Junior high school	32	58.2	23	41.8		
Senior high school	5	55.6	4	44.4		
Pregnancy age					0.442	0.551
Preterm	27	55.1	22	44.9		
Aterm	35	62.5	21	37.5		
Paritas					0.383	1.005
Primipara	24	57.1	18	42.9		
Multipara	34	57.6	25	42.4		
Grandemultipara	4	100.0	0	0.0		
Pregnancy spacing					0.024	0.028
< 2 Th - >10 th	31	50.0	31	5.0		
2 – 10 Th	31	72.1	12	27.9		
Preeclampsia history					0.000	0.000
Yes	2	14.3	12	85.7		
No	60	65.9	31	34.1		
Diabetes melitus history					0.090	0.120
Yes	2	28.6	5	71.4		
No	60	61.2	38	38.8		

grandemultigravida respondents did not experience preeclampsia, which was 100%. The results of the Chi Square statistical test obtained 0.994> α (0.05) with a Contingency Coefficient I value = 1.005, so H0 was accepted, which means that there is no effect of parity of pregnant women on the incidence of preeclampsia at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Hospital.

In the spacing variable, the results show that in pregnant women with spacing <2 years - >10 years, the same number of those who do not experience preeclampsia and those who do is 50%. While pregnant women with spacing 2-10 years mostly do not experience preeclampsia, which is 72.1%. The results of the Chi Square statistical test obtained 0.024 <α (0.05) with a value of Coefficient Contingency I = 0.028, so H0 is rejected, which means that there is an effect of spacing on the incidence of preeclampsia at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regency Hospital with a high level of correlation.

In the variable of preeclampsia history, the results showed that in pregnant women with a history of preeclampsia, most of them experienced preeclampsia, which was 85.7%. While pregnant women without a history of preeclampsia, most of them did not experience preeclampsia, which was 65.9%. The results of the Chi Square statistical test obtained 0.001 <α (0.05) with a value of Coefficient Contingency I = 0.001, so H0 was rejected, which means that there is an influence of preeclampsia history on the incidence of preeclampsia in pregnancy at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regency Hospital with a high level of correlation.

In the variable of history of diabetes mellitus, the results showed that in pregnant women with a history of diabetes mellitus, most of them experienced preeclampsia, which was 71.4%. While pregnant women without a history of diabetes mellitus mostly did not experience preeclampsia, which was 61.2%. The results of the Chi Square statistical test obtained 0.090>α (0.05) with a value of Coefficient Contingency I = 0.120, so H0 was accepted, which means there is no influence of history of diabetes mellitus on the incidence of

preeclampsia in pregnancy at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regency Hospital.

3.3 Multivariate Analysis

Table 3 shows that partially the variables of PE history, maternal age and spacing have an effect on the incidence of preeclampsia ($p<0.05$). The variable of preeclampsia history obtained Wald = 11.158 meaning that the variable of preeclampsia history is the most dominant in influencing the incidence of preeclampsia at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regency Hospital.

Table 3. Results of partial multivariate analysis of risk factors for pregnant women on the incidence of preeclampsia at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regional Hospital in 2024 (n=105)

Variable	B	S.E	Wald	df	Sig.	Exp(B)	Lower	Upper
PE history	3.013	0.902	11.158	1	0.001	20.356	3.474	119.288
Mother age	1.250	0.570	4.808	1	0.028	3.492	1.142	10.676
Pregnancy spacing	1.406	0.667	4.450	1	0.035	4.081	1.105	15.072

Table 4 Results of partial multivariate analysis of risk factors for pregnant women on the incidence of preeclampsia at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regency Hospital in 2024 (n=105)

Variable	p-value	Nagelkerker R Square
PE history	0.243	0.327
Mother age		
Pregnancy spacing		

Table 4 shows the results of multivariate analysis with multiple logistic statistical tests obtained a sig value = 0.243 then the three variables (PE history, maternal age and spacing) have an effect on the incidence of preeclampsia. And based on the Model Summary table, the Nagelkerke's R Square value is 0.327. This indicates that the factors of pregnant women at risk of experiencing preeclampsia can be explained by the factors of PE history, maternal age and spacing by 32.7%, while the remaining 67.3% is explained by the variability of other variables outside the four variables that have been studied.

4. DISCUSSION

4.1 Analysis of Maternal Age on the Incidence of Preeclampsia

From the research results, it was found that those aged less than 20 years or more than 35 years mostly experienced preeclampsia as much as 60%. While in pregnant women aged 20-25 years, most did not experience preeclampsia. The results of the Chi-Square statistical test showed that there was a significant influence between maternal age and the incidence of preeclampsia at Dr. R. Sososdoro Djatikoesoemo Bojonegoro Regional Hospital: $p < \alpha$ (0.026).

The results of this study are in line with the results of the study Widya Kusumawati, dkk (2016) where there was a significant relationship between maternal age and the incidence of preeclampsia. The incidence of preeclampsia increased in mothers aged >35 years.[2,6] Pregnant at an age of less than 20 years where the reproductive organs are not ready and during pregnancy will occur pregnancy poisoning in the form of preeclampsia. While at the age of more than 35 years is very susceptible to hypertension and preeclampsia, this occurs because of changes in the uterine tissues and also the birth canal is no longer flexible.[7] Literature review research Sudarman 2021, from twenty journals obtained a p value <0.05 which means there is a relationship between the age of pregnant women at risk (<20 years or> 35 years) with the occurrence of preeclampsia.[8,9] Preeclampsia that occurs in the first pregnancy causes antibody blocking at the antigenic site of the placenta so that it is likely to experience disorders, this causes an increased risk of preeclampsia. Women aged> 35 years' experience a degenerative process so that peripheral blood vessels experience structural and functional changes and cause changes in blood pressure so that they are at high risk of preeclampsia. According to KIA at all, 2021, most women aged 40 years and over experience preeclampsia with severe symptoms, indicating that age can drive the severity of the disease regardless of the method of conception. The age of the pregnant woman has an effect on pregnancy.[10,11] The age that is likely not at high risk during pregnancy is 20-35 years old, because at that age the uterus is ready to receive pregnancy, the mother's mentality is also mature and she is able to take care of the baby and herself. While at the age of less than 20 years and more than 35 years is the age that is at high

risk for pregnancy. Women who are >35 years old are at risk of suffering from chronic hypertension which will continue to become superimposed preeclampsia during pregnancy.[12,13] The physical condition of pregnant women with an age of >35 years will affect the condition during pregnancy and childbirth later, the condition of the fetus will also be affected. Pregnant women who are >35 years old will experience many difficulties because at that age the mother is susceptible to disease and because the reproductive organs are aging the birth canal is also stiffer so that there is a stalled labor and bleeding. In addition, the possibility of having a disabled child is also greater. Therefore, as health workers, we must provide knowledge to mothers about the dangers and risks of getting pregnant at old period.

4.2 Analysis of Maternal Education on the Incidence of Preeclampsia

The results of the study showed that respondents who did not attend school and had low education did not experience preeclampsia as much as 100%. Mothers with basic education mostly did not experience preeclampsia, which was 60%, pregnant women with secondary education mostly did not experience preeclampsia, which was 58.2% and pregnant women with higher education mostly did not experience preeclampsia. Based on the results of the Chi-Square statistical test, it was found that education had no effect on the incidence of preeclampsia at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regional Hospital: p> α (0.856).

The results of this study are in line with the results of research conducted by Nort et al (2011) stating that there is no significant relationship between education and the incidence of preeclampsia where there is no difference in incidence between pregnant women with low, secondary and higher education.[14] This study is also in line with the results of research Nursal et al (2015), that the relationship between education level and the risk of preeclampsia shows insignificant results.[15] In contrast to the research results from Dien, et all, 2015 which showed that mothers with high and low education have the same chance of getting preeclampsia.[7,16]

Low education does not necessarily have low knowledge, this is because they get knowledge from health workers in the form of counseling, from people around them and also from social media. So they have the awareness to check their pregnancy regularly at health service facilities. Educational theory says that education is an activity or effort to improve personality, so that the process of behavioral change leads to maturity and perfection of human life. So education needs to be a consideration and cannot only be used as supporting data. Pregnant women with higher education are expected to be able to easily receive information or health education from health workers or information media in the form of counseling regarding danger signs of pregnancy and early detection of preeclampsia in pregnant women. Education indirectly influences determining and making a decision, so that pregnant women can immediately take action for their health.

4.3 Analysis of Gestational Age on the Incidence of Preeclampsia

Based on the results of the study, it was shown that respondents who had preterm gestational age, the majority did not experience preeclampsia, which was 55.1%. And from the aterm gestational age, the majority did not experience preeclampsia, which was 62.5%. The results of the Chi Square statistical test showed that there was no effect of gestational age on the incidence of preeclampsia at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regional Hospital: p>α (0.840). This study is in line with the Study by Ananth et al. (2013) Title: "Epidemiology of Pre-eclampsia: Global Burden of Disease." Findings: This study discusses the epidemiology of preeclampsia globally, including variations in incidence and risk factors in various populations. Gestational age after 20 weeks is referred to as a critical point for the emergence of preeclampsia, but gestational age itself is not considered a significant risk factor compared to other factors such as maternal health history and socio-economic conditions.[17] This study shows that preeclampsia is more related to other factors, such as maternal and placental health conditions, than gestational age itself. Preeclampsia does occur after a certain gestational age (usually after 20 weeks), but there is no strong evidence that the length of pregnancy directly affects the risk of preeclampsia.[18]

Preeclampsia is a pregnancy complication characterized by high blood pressure and organ damage, usually the kidneys, that occurs after 20 weeks of pregnancy. Gestational age does not directly affect the risk of preeclampsia because preeclampsia is influenced by other factors, such as: genetic and

immunological factors. The risk of preeclampsia is more related to how the mother's body responds to pregnancy from a genetic and immunological perspective, rather than how long the pregnancy has lasted. Personal risk factors: conditions such as a history of preeclampsia in a previous pregnancy, chronic hypertension, diabetes, or autoimmune disorders affect the risk of preeclampsia more than gestational age. Placental problems: preeclampsia is often associated with problems in the development of the placenta. If the placenta does not develop properly or does not function optimally, this can trigger preeclampsia, regardless of gestational age. From the explanation above, it can be seen that preeclampsia is more influenced by a complex interaction between genetic, immunological, and placental factors, which can occur at any time after the 20th week of pregnancy, regardless of gestational age at that time. In the majority of primigravida, pregnancy from 28 to 32 weeks shows an increase in diastolic pressure of at least 20 mmHg which can lead to preeclampsia in pregnancy.

4.4 Parity Analysis of Preeclampsia Incidence

The results of the study showed that the parity of primigravida, multigravida and grandemulti mostly did not experience preeclampsia. The results of the Chi-Square statistical test showed that parity did not affect the incidence of preeclampsia at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regional Hospital with a p value > α (0.236). The results of this study are in line with research conducted at the Kardinah Regional General Hospital in Tegal City which found that there was no significant relationship between parity and preeclampsia.[7,19] Parity is the number of live births a woman has.[20,21] The parity of the second and third children is the safest parity in terms of maternal mortality. In theory, primigravida are more at risk of experiencing preeclampsia than multigravida because preeclampsia usually occurs in women who are first exposed to chorionic villi. This happens because in women who are pregnant for the first time, the immunological mechanism of blocking antibody formation carried out by human leukocyte antigen G (HLA-G) against placental antigens has not been formed perfectly, so that the process of trophoblast implantation into the mother's decidual tissue is disrupted. The stress felt by the mother will stimulate the body to release cortisol. The effect of cortisol is to increase the sympathetic response, so that cardiac output and blood pressure will also increase. In addition to primigravida/primipara, women with high parity or repeated childbirth will have many risks to pregnancy.[22,23]

Mothers with grandemultigravida status are very rare nowadays, almost non-existent or not found. This is because currently accessing information sources is very easy compared to the past and there has been a paradigm shift where the number of children is now a consideration in terms of family economy. The change in the mindset of many children, many blessings has begun to change, because the current condition is the opposite if they have many children, their responsibilities and needs are also increasing. So now it is rare to find grandemultigravida mothers. Currently, grandemultigravida mothers are shifting to multigravida because now there is a Family Planning program, so it is rare for mothers to be pregnant more than 4 times.

Although in this study there was no influence of grandemultigravida on the incidence of preeclampsia, it remains one of the risk factors for the occurrence of preeclampsia that must be watched out for in multigravida who experience excessive uterine stretching which can cause excessive ischemia which can cause preeclampsia.[24] Mothers with high parity (more than 4) have experienced a decrease in reproductive system function, in addition, mothers are usually too busy taking care of the household so that they often experience fatigue and pay less attention to fulfilling their nutrition.[25]

4.5 Spacing Analysis of Preeclampsia Incidence

In this study, it was found that respondents with a spacing of less than 2 years or more than 10 years who experienced preeclampsia were 50%, while respondents with a spacing of 2-10 years mostly did not experience preeclampsia, which was 72.1%. The results of the Chi Square statistical test showed that there was an effect of spacing on the incidence of preeclampsia at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regional Hospital with a p value <α (0.024). This is in line with the results of the study Rimawati U, 2018 which showed that there was a significant effect between pregnancy spacing and the occurrence of preeclampsia with a p value <α (0.041).[7]

Pregnancy spacing is a consideration to determine the first pregnancy with the next pregnancy. Pregnancy spacing that is too close is the distance

between one pregnancy and the next (<2 years) at that time the mother's uterus has not fully recovered. Pregnancy spacing that is too close can cause serious complications in pregnancy and the birth process. Pregnancy spacing that is too far is the distance between pregnancies that has a period of more than 10 years from the previous pregnancy. The risk to the mother is susceptible to possible complications such as preeclampsia.[10] Birth spacing is one of the predisposing factors for preeclampsia. The ideal birth spacing is a good time limit for pregnancy for both the mother and the child because it can reduce the incidence or maternal mortality and problems in pregnancy such as preeclampsia.[26]

4.6 Analysis of Preeclampsia History Against Preeclampsia Incidents

The results of this study indicate that most pregnant women who have a history of preeclampsia are at risk of experiencing preeclampsia by 85.7% and pregnant women who do not have a history of preeclampsia do not experience preeclampsia by 65.9%. The results of the Chi-Square statistical test showed that there was an influence of a history of preeclampsia on the incidence of preeclampsia at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regional Hospital: $p < \alpha$ (0.001). This study is in line with Sugiarti et al (2017) which shows a significant relationship between a history of hypertension and the incidence of preeclampsia ($p = 0.000$ and $RR = 2.2$).[27] The results of the study Saraswati dan Mardiana (2016) prove that pregnant women with a history of preeclampsia in previous pregnancies are 20 times more likely to experience preeclampsia.[26]

A history of preeclampsia in a previous pregnancy is a major risk factor.[11] The risk increases up to sevenfold. Pregnancy in women with a history of previous preeclampsia is associated with a high incidence of severe preeclampsia and adverse perinatal outcomes.[19,29] Preeclampsia is a cause of high maternal and perinatal mortality, especially in developing countries. Therefore, establishing a diagnosis of preeclampsia is the goal of treatment by taking promotive and preventive measures. Risk factors for preeclampsia in mothers with a history of preeclampsia need to be watched out for, because pregnant women with a history of preeclampsia have a risk of preeclampsia again, this requires stricter supervision because it is very dangerous if a pregnant woman experiences preeclampsia, it can also affect her baby. By carrying out routine antenatal care at health service facilities, complications that may arise can be prevented and can be handled quickly and appropriately. Screening for risk factors for preeclampsia can prevent complications that arise during pregnancy. This incident can be minimized by providing counseling to every pregnant woman so that they can recognize the danger signs that could occur during pregnancy, especially for pregnant women who have a history of hypertension so that they can pay more attention to food, the health of the mother and fetus and diligently carry out pregnancy checks with health workers.

4.7 Analysis of Diabetes Mellitus History on Preeclampsia Incidence

In a study at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regional Hospital, it was found that most respondents who had a history of Diabetes Mellitus experienced preeclampsia, which was 71.4%, while respondents who did not have a history of Diabetes Mellitus did not experience preeclampsia. The results of the Chi-Square statistical test showed that there was no effect of Diabetes Mellitus on the incidence of preeclampsia. This study is not in line with Valdes et al where the risk factor that increases the incidence of PEB is mothers who have had a history of type 1 or 2 Diabetes Mellitus.[30]

Diabetes mellitus in pregnancy causes many difficulties, because this disease will cause many metabolic and hormonal changes in sufferers who are also affected by pregnancy. Complications of influence in pregnancy are abortion, premature labor, preeclampsia, hydramnios, fetal abnormality, placental insufficiency. While the effects on the fetus are abortion, congenital defects, dysmaturity, large fetus, death in pregnancy, neonatal death, neurological disorders, hypocalcemia, hypobilirubinemia.[20] Diabetes Mellitus remains one of the risk factors for preeclampsia because diabetes mellitus increases glucose levels, which is one of the factors causing preeclampsia.

The limitation of this research is it is conducted as an observational analytic method using a cross-sectional design which only studied the risk factors of preeclampsia patients and did not involve further research regarding the relationship between each variable. Not all risk factors for preeclampsia have been studied.

5. CONCLUSION

In this research, factors that have a significant influence on the incidence of preeclampsia at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regency Hospital are maternal age, spacing and history of preeclampsia. And the most dominant factor that has an influence on the incidence of preeclampsia is a history of preeclampsia (Wald = 11.158). Factors that have no influence on the incidence of preeclampsia at Dr. R. Sosodoro Djatikoesoemo Bojonegoro Regency Hospital are education, gestational age, parity and history of diabetes mellitus.

Ethics Approval

This study received ethical exemption from the Ethics Committee of Poltekkes Kemenkes Surabaya (Approval No. EA/2450/KEPK-Poltekkes_Sby/V/2024).

Acknowledgement

We sincerely thank the Director of Poltekeks Surabaya, Head of Research and Community Service Unit of Poltekkes Surabaya, Director of Dr R Sosodoro Djatikoesoemo Hospital, Chair of the Midwifery Department, fellow lecturers, and all contributors to this research report.

Competing Interests

All the authors declare that there are no conflicts of interest.

Funding Information

This research was funded by the Surabaya Ministry of Health Polytechnic under DIPA Fund (Funding no. HK.02.03/F.XXIV/1055/2024).

Underlying Data

Derived data supporting the findings of this study are available from the corresponding author on request.

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