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Original Research Article

Studi Cross-Sectional: Determinants of Preeclampsia in Pregnant Women in the Martapura 1 Health Center Area, South Kalimantan

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ABSTRACT

Preeclampsia is characterized by hypertension accompanied by proteinuria or edema, typically occurring after 20 weeks of gestation until the end of the first postpartum week. It remains one of the top five causes of maternal mortality. According to data from Martapura 1 Community Health Center, 45 cases of preeclampsia were reported from 1,245 examined pregnant women between January and July 2023. This study aimed to identify the risk factors associated with preeclampsia among pregnant women in this area. Using an analytical observational method with a cross-sectional design, the study was conducted in October–November 2023 and involved 102 respondents selected via cluster random sampling. Data collection utilized questionnaires and maternal health books. Statistical analysis revealed significant associations between maternal age and preeclampsia ($p = 0.011$), and between chronic energy deficiency (CED) and preeclampsia ($p = 0.021$). However, family history ($p = 0.371$), diabetes mellitus, quality of health services, and antenatal care interest were not significantly associated. The latter variables were analyzed descriptively due to test limitations. The study concluded that maternal age and CED are significantly associated with preeclampsia, with maternal age being the most dominant factor.

Keywords: Preeclampsia; Age; CED; Family History; Pregnant mother

INTRODUCTION

Preeclampsia is high blood pressure accompanied by proteinuria or edema, which occurs at 20 weeks of pregnancy until the end of the first week after delivery (Sukarni, 2014). However, in 2013 and 2014, the International Society for the Study of Hypertension in Pregnancy (ISSHP) and the American College of Obstetricians and Gynecologists (ACOG) revised their definitions and stated that a diagnosis of preeclampsia can be made in the absence of proteinuria when other specific diagnoses are present (Bouter, 2020). According to WHO, the incidence of preeclampsia in 2017 ranged from 0.51%-38.4% (Indonesian Ministry of Health, 2017). In Indonesia, the causes of maternal death are still dominated by three main causes, namely bleeding, preeclampsia in pregnancy and infection. Causes of bleeding reached 30.3%, preeclampsia reached 27.1% and infection reached 7.3% (Indonesian Ministry of Health, 2016). Several causes of maternal death in South Kalimantan Province are bleeding, preeclampsia, infection, circulatory system disorders,

metabolic disorders, and other factors that tend to lead to diseases that accompany pregnancy. Based on data in 2021, preeclampsia is the second highest factor after bleeding which causes maternal death. Based on data, preeclampsia women from 2019-2021 have always increased, namely at 19 in 2019, 27 in 2020, and 34 in 2021 (Indonesian Ministry of Health, 2017; South Kalimantan Provincial Health Service, 2020; South Kalimantan Provincial Health Service, 2021).

Preeclampsia is a specific condition in pregnancy characterized by placental dysfunction and maternal response to systemic inflammation with endothelial activation and coagulation. The magnitude of this problem is not only because preeclampsia impacts mothers during pregnancy and childbirth but also causes postpartum problems due to endothelial dysfunction in various organs, such as the risk of cardiometabolic disease and other complications. Long-term impacts can also occur in babies born to mothers with preeclampsia, such as low birth weight due to premature labor or experiencing stunted fetal growth, and also contribute to high rates of perinatal morbidity and mortality (Indonesian Ministry of Health, 2017).

Based on in 2021, Banjar Regency is the second highest district with a still high MMR, namely 16 per 100,000 live births. Apart from that, in the last few years, Banjar Regency has always been in the top 3 districts with high MMR. Then there is a trend in MMR which always increases every year starting from 2020 and 2021 with the same number of deaths, namely 8 deaths, then increasing drastically in 2022 with a total of 19 deaths. The cause of death is dominated by preeclampsia, this is what makes researchers want to examine the causes of maternal death, especially preeclampsia in Banjar Regency (South Kalimantan Provincial Health Service, 2021).

Furthermore, the estimated data for pregnant women with pregnancy complications which also includes the incidence of preeclampsia in 2022 is a total of 2,398 pregnant women, of which the highest data is in the working area of Martapura 1 Health Center with a total of 352 pregnant women (Banjar District Health Service, 2022). Based on data from the Martapura 1 Community Health Center, 45 incidents of preeclampsia occurred in the Martapura 1 Community Health Center working area in January-July 2023 out of 1,245 pregnant women examined (Martapura Community Health Center 1, 2023).

According to Mc Carthy and Maine (1992), risk factors for preeclampsia are health status, reproductive status, access to health services, and healthy behavior (McCarthy, 1992). Meanwhile, according to Scott (2002), risk factors for preeclampsia consist of primigravida status, family history of preeclampsia, history of preeclampsia, new husband, age, suffering from hypertension, diabetes mellitus, multiple pregnancies, non-immune and alloimmune hydrops fetalis, trisomy 13, and hydatous mole (Scott, 2002). Based on this background, researchers are interested in examining the risk factors for preeclampsia in pregnant women at the Martapura 1 Community Health Center, Banjar Regency to detect it early to reduce the incidence of preeclampsia in pregnant women.

METHOD

The research was conducted in the work area of Martapura 1 Community Health Center, Banjar Regency, South Kalimantan Province in October-November 2023. This research is an analytical observational study with a cross-sectional design. The population in this study were pregnant women in the Martapura 1 Community Health Center Working Area, Banjar Regency, South Kalimantan with a total of 1,748 pregnant women. A sample of 102 was obtained from calculating the population proportion formula with precision with the CI 95% and margin of error 5% used in the calculation. Sampling in this study used the cluster random sampling technique.

The inclusion criteria used by researchers in this study are as follows:

a. Currently pregnant with a gestational age of ≥20 weeks.

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b. Not pregnant with twins
c. Have had a pregnancy check-up with a health worker at least once.
d. Have had a complete blood test (laboratory check) during the second trimester of pregnancy and above
e. Have a KIA book (pink book) that has been filled in by a health worker.
f. Willingness to be a respondent.

The data collection process is carried out when pregnant women come to the Village Health Post (Poskesdes) to check their pregnancy, at that time the enumerator, in this case the village midwife, provides an explanation of the research and questionnaire as well as informed consent. Data collection was carried out using a questionnaire instrument that had been tested for validity and reliability as well as the KIA book. The definition of preeclampsia used in this study is an increase in systolic blood pressure of 30 mm Hg or more above the usual pressure, or reaching 140 mm Hg or more. An increase in diastolic blood pressure of 15 mm Hg or more, or to 90 mm Hg or more, and there is proteinuria of ≥0.3 g based on laboratory results measured at a gestational age of more than 20 weeks. Data were analyzed with the SPSS application using the Fisher exact statistical test with confidence interval 95% and multiple logistic regression, the criteria used to include variables in the logistic regression model was $p < 0.05$ in bivariate analysis. This research has received an ethical letter from the ethics commission of the Faculty of Medicine, Lambung Mangkurat University with Ethical letter number: 288/KEPK-FK ULM/EC/IX/2023. This research uses the researcher's personal funds, so there is no conflict of interest in it.

RESULTS AND DISCUSSION

Table 1. Frequency Distribution of Respondent Characteristics

Characteristics	Frequency (people)	Percentage (%)
Village		
Cindai Alus	24	23,5
Sekumpul	46	45,1
Sungai Sipai	32	31,4
Education		
Elementary School/Equivalent	11	10,8
Middle/Junior High School or equivalent	15	14,7
High school/ equivalent	46	45,1
College	30	29,4
Work		
Doesn't work	79	77,5
Work	23	22,5

Based on table 1, it shows the frequency distribution of respondents' characteristics consisting of sub-district address, education and employment. Respondents predominantly had addresses in Sekumpul Subdistrict, namely 46 (45.1%) respondents. Furthermore, the dominant level is high school/high school education with the number 46 (45.1%), and the majority of respondents who do not work with the number 79 (77.5%).

Table 2. Relationship between independent variables on the incidence of preeclampsia

Variable	Preeclampsia				*p-value*	PR value (95%CI)
	Yes		No			
	n	%	n	%		

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Age at Pregnancy (Year)						
Risky	6	5,9	7	6,8	0,011	3,42
No Risk	12	11,8	77	75,5		
Chronic Energy Deficiency (CED)						
Yes	0	0	19	18,6	0,021	1,28
No	18	17,6	65	63,8		
DM						
Yes	0	0	0	0	-	-
No	18	17,6	84	82,4		
Family History						
Yes	6	5,9	19	18,6	0,371	-
No	12	11,8	65	63,7		
Quality of Community Health Center Services						
Good	18	17,6	84	82,4	-	-
Bad	0	0	0	0		
Interest in Pregnancy Checks						
High	18	17,6	84	82,4	-	-
Low	0	0	0	0		

Age at Pregnancy

Based on table 2, the research results show that the p-value=0.011, from the p-value in the statistical test results, it was found that Ho's decision was rejected (p<0.05), which means there is a relationship between age at pregnancy and the incidence of preeclampsia. There is a prevalence ratio (PR) of 3.42, which means that pregnant women of at-risk age will be at risk of experiencing preeclampsia 3.42 times compared to pregnant women of no-risk age. According to Cuningham, women aged < 20 years or > 35 years are at risk of experiencing preeclampsia. At age < 20 the reproductive state is not ready to accept pregnancy. This is in line with meta-analysis research by Ayunani (2019). There is a significant relationship between maternal age during pregnancy and preeclampsia, with a pooled odds ratio value of 2.37 (95% CI 2.29-2.46), which means that a mother Those who are at risk during pregnancy have a 2.37 times greater risk of experiencing preeclampsia than mothers who are not at risk (Tungga, 2016).

Ages over 20 years and under 35 years are the ideal ages for women to get pregnant. Women under 20 years of age have a high risk of becoming pregnant because the reproductive organs for girls under 20 years of age are not ready to have sex or conceive so that if pregnancy occurs there is a risk of experiencing high blood pressure (because the body is not strong), premature birth, low birth weight, and risk of developing cervical cancer (Tungga, 2016). Pregnancy at the age of over 35 years is also a high risk of getting pregnant, because the female reproductive organs have weakened, many diseases can occur, such as heart disease, high blood pressure, diabetes mellitus, so women must be careful when deciding to give birth over the age of 35 years. Pregnant women over 35 years of age usually have doctors recommend frequent pregnancy check-ups or undergoing a series of tests, genetic counseling and screening for

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problems that may occur in pregnant women over 35 years of age (12).

Age is an important part of reproductive status. Age is related to the increase or decrease in bodily functions, thus affecting a person's health status. A good age for pregnancy is 20 to 35 years (Aulya, 2021). Royston and Armstrong (1994) also stated that teenage women who are pregnant for the first time and women who become pregnant at the age of >35 years will have a very high risk of experiencing preeclampsia (Armagustini, 2010). In pregnancies <20 years, reproductive conditions that are not yet ready to accept pregnancy will increase pregnancy toxicity in the form of preeclampsia or toxemia gravidarum. Meanwhile, at the age of 35 years or more, changes will occur in the reproductive tissues and organs and the birth canal will no longer be flexible. At this age, other diseases tend to occur in the mother's body, one of which is hypertension and preeclampsia (Manuaba, 2007).

This is in line with meta-analysis research by Ayunani (2019). There is a significant relationship between maternal age during pregnancy and preeclampsia, with a pooled odds ratio value of 2.37 (95% CI 2.29-2.46), which means that a mother Those who are at risk during pregnancy have a 2.37 times greater risk of experiencing preeclampsia than mothers who are not at risk (Ayunani, 2019).

Chronic Energy Deficiency (CED)

Based on table 2, the research results show that the p-value=0.021, from the p-value in the statistical test results, the Ho decision was rejected (p<0.05), which means there is a relationship between CED and the incidence of preeclampsia. There is a prevalence ratio (PR) from the results of the table, namely 1.28, which means that pregnant women with CED will have a risk of experiencing preeclampsia 1.28 times compared to pregnant women without CED. The risk factor for preeclampsia examined in this study was the nutritional status of pregnant women which was known from chronic energy deficiency (CED) as measured by upper arm circumference. In line with research by Aulya (2021) which states that there is a significant relationship between nutritional status and the incidence of preeclampsia in pregnant women at the Sepatan Public Health Center, Tangerang Regency in 2021 with an OR value of 12,250 ≈ 12.3, meaning that respondents who have poor nutritional status have a chance of 12.3 times experienced preeclampsia in pregnant women (Aulya, 2021; Ruaida, 2018).

Nutritional status is an important thing to pay attention to during pregnancy, because nutritional factors greatly influence the mother's health status during pregnancy and are useful for the growth and development of the fetus. The relationship between pregnant women's nutrition and fetal well-being is a very important thing to pay attention to. Not only during pregnancy, teenagers who will later become mothers-to-be or will go through the pregnancy period are certainly a vulnerable group that can be the focus of preventing CED from an early age (Jannah, 2012).

The nutritional status of pregnant women can be seen from the results of measurements of upper arm circumference. The upper arm circumference measurement aims to detect whether pregnant women fall into the chronic energy deficiency (CED) category or not. Mothers with poor nutritional status are at risk of bleeding and infection during the postpartum period. Malnutrition before and during pregnancy contributes to poor maternal health, problems in childbirth and problems with the baby being born. The minimum standard upper arm circumference size for adult women or reproductive age is 23.5 cm. Upper arm circumference size < 23.5 cm then the interpretation is Chronic Energy Deficiency (CED) (Jannah, 2012).

The nutritional status factor of pregnant women can be determined from the state of chronic energy deficiency (CED) which is measured from the upper arm circumference (Ruaida, 2018). In line with research by Aulya (2021) which states that there is a significant relationship between nutritional status and the incidence of preeclampsia in pregnant women at the Sepatan Public

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Health Center, Tangerang Regency in 2021 with an OR value of 12,250 ≈ 12.3, meaning that respondents who have poor nutritional status have a chance of 12.3 times experienced preeclampsia in pregnant women (Aulya, 2021).

Diabetes Mellitus (DM)

Based on table 2, the research results show that statistical test results with a 95% confidence level to see the relationship between DM and the incidence of preeclampsia cannot be analyzed because they do not meet the statistical test requirements, this is because there are 2 table cells with a value of 0. The data was obtained using a design. cross-sectional research in which both independent variable and dependent variable data were taken at one time, and the data collection process was taken based on pregnant women who came to the village health post or posyandu when they wanted to have their pregnancy checked, so that at the time of the research, it turned out that only samples of pregnant women were taken who were not I have DM.

Pregnant women who have diabetes mellitus have a greater risk of developing preeclampsia. Kurniasari's research results (2015) stated that mothers with diabetes mellitus had a 14.37 times chance of developing preeclampsia when compared to mothers who did not have diabetes mellitus. The increased risk of preeclampsia with diabetes mellitus is due to insulin resistance in pregnant women. This insulin resistance makes it difficult for the body to regulate blood sugar levels, resulting in glucose not being converted into energy and accumulation in the blood. This condition causes blood sugar levels to increase (Kurniasari, 2015).

According to Scott's theory (2002), preeclampsia tends to occur in women who have a history of disease, in this case suffering from diabetes mellitus because diabetes is a disease that can be a trigger factor for preeclampsia (Scott, 2002). Almost 50% of diabetes mellitus that occurs in pregnant women develops into preeclampsia. This happens because during pregnancy, the placenta plays a role in meeting all the fetus's needs. Preeclampsia occurs in mothers with diabetes mellitus due to increased production of deoxycorticosterone (DOC) which is produced from progesterone in the blood plasma and increases sharply during the third trimester. Hypertension is often found in diabetic women with kidney disease so they are at high risk of developing preeclampsia (Bardja, 2020). This research is in line with research by Aulya (2021) which states that there is a significant relationship between the history of the disease and the incidence of preeclampsia in pregnant women at the Sepatan Community Health Center, Tangerang Regency in 2021. Diabetes mellitus is included. Statistical test results also show that respondents who have a history of the disease have as many chances as 13.3 times pregnant women experience preeclampsia (Aulya, 2021).

Family History

Based on table 2, the research results show a p-value = 0.371, from the p-value in the statistical test results, the Ho decision was accepted (p> 0.05), which means there is no relationship between family history and the incidence of preeclampsia. A family history of preeclampsia is included in the risk factors for preeclampsia, this is based on Scott's theory (2002) (Scott, 2002). In line with Bardja's research (2020) which states that there is a relationship between a family history of preeclampsia and the incidence of preeclampsia. The mother's family history of preeclampsia is at risk 4, 5 times the risk compared to women without a family history of preeclampsia (Bardja, 2020). The presence of preeclampsia in a first degree relative will also increase a woman's risk of experiencing severe preeclampsia by two to four times (Wang, 2009).

Preeclampsia tends to increase in women who have mothers with preeclampsia and the frequency of preeclampsia increases in the offspring of pregnant women with preeclampsia. 20 – 40% occur in girls whose mothers have a history of preeclampsia. In women who have a sister with a history of preeclampsia 11 – 37% and in women who have a twin sister with a history of preeclampsia 22 – 47% (Lalenoh, 2018). This tendency shows that there are genetic factors

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determined by the mother's genotype that cause preeclampsia (Prawirohardjo, 2013). The results of Saraswati's (2016) findings show that a family history of preeclampsia has a 2.618 times risk of experiencing preeclampsia and is more often found in daughters of mothers who suffer from preeclampsia (Saraswati, 2016).

However, the findings from this study show that there is no relationship between a family history of preeclampsia and the incidence of preeclampsia, this is supported by research by Shofia (2022) which states that a family history of preeclampsia is not related to the incidence of preeclampsia (Shofia, 2022).

Quality of Community Health Center Services

Based on table 2, the research results show that of the 102 respondents (100%), both those who experienced preeclampsia and those who did not, they considered that the quality of puskesmas services was classified as good. The results of statistical tests with a confidence level of 95% to see the relationship between the quality of health center services and the incidence of preeclampsia cannot be analyzed for chi-square and Fisher exact relationships because they do not meet the statistical test requirements, this is because there are 2 table cells with a value of 0. These data obtained using a cross-sectional research design where both independent variable and dependent variable data were taken at one time, and the data collection process was taken based on pregnant women who came to the village health post or posyandu when they wanted to have their pregnancy checked, so that at the time of the research, it turned out that only a sample was taken pregnant women who assess that the quality of puskesmas services is classified as good.

However, based on a literature review, the quality of pregnancy checks is closely related to the implementation of midwifery service standards. Implementing service standards will also protect the public, because the assessment of the assessment process and results can be carried out on a clear basis. Preeclampsia and eclampsia are ongoing complications of pregnancy, therefore through pregnancy checks the aim is to prevent the development of preeclampsia, or at least detect it early so as to reduce the incidence of morbidity (Kemenkes, 2012).

Pregnancy services are health services provided to mothers during pregnancy in accordance with antenatal care standards which include anamnesis, general physical examination and obstetrics, laboratory examinations for certain indications as well as basic and special indications. Apart from that, other aspects are counseling, Communication, Information and Education (KIE), motivation of pregnant women and referrals (Ariyanti, 2010).

Service quality is a person's actions towards other parties through the presentation of products or services in accordance with consumer tastes, expectations and needs. Parasuraman (2001) put forward the concept of service quality which is related to satisfaction determined by five elements which are commonly known as service quality "RATER" (responsiveness, assurance, tangible, empathy and reliability) (Parasuraman, 2001).

Interest in Checking Pregnancy

Based on table 2, the research results show that the results of statistical tests with a confidence level of 95% to see whether there is a relationship between interest in having a pregnancy check-up and the incidence of preeclampsia cannot be analyzed because they do not meet the statistical test requirements, this is because there are 2 table cells with a value of 0. These data were obtained. using a cross-sectional research design where both independent variable and dependent variable data were taken at one time, and the data collection process was taken based on pregnant women who came to the village health post or posyandu when they wanted to have their pregnancy checked, so that at the time of the research, it turned out that only a sample of mothers was taken. pregnant women who feel that their interest in having their pregnancy checked is high.

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Interest is an involuntary concentration of attention that is born with full will. Interest is actually subjective because each person can differentiate their interests. Interest is closely related to feelings of liking or disliking, interested or not interested, happy or unhappy. Having an interest in a person can be an encouragement to do something, including in this case the behavior of having a pregnancy check-up which will detect the incidence of preeclampsia early, so that if the mother has a high interest in having a pregnancy check-up, then efforts to prevent preeclampsia will be carried out early and reduce the risk of this incident (Rufaidah, 2015).

Interest is one of the factors that influences behavior and undergoes a process of change throughout human life. Interest is also often defined as an impulse that arises within a person, both consciously and unconsciously, which makes people behave to achieve goals in accordance with their needs (Aprilia, 2020). Research by Priyanti et al (2020) shows that 26% of mothers with high-risk pregnancies have never had a pregnancy check-up visit, while 80% of pregnant women without pregnancy complications have had regular prenatal check-ups. Pregnant women who have never had an antenatal visit experience pregnancy complication, namely chorioamnionitis and placental abruption and are 9.18 times at risk of giving birth to a baby with a low birth weight, 12.05 times the risk of fetal death and 10.03 times the risk of neonatal death (Sari, 2020).

Table 3. Factors associated with the occurrence of preeclampsia

Variable	B	SE	Sig.	Wald	Exp B	95% CI	
						Lower	Upper
Age at Pregnancy	1.593	.658	.016	5.850	4.917	1.353	17.872
CED	-19.772	9103.826	.798	.000	.000	.000	.

Based on table 3, the results of the multivariate test using multiple logistic regression show that the B value is positive for the age variable during pregnancy. This shows a positive or unidirectional influence, which means that if the mother's age is at risk during pregnancy, she will also be at risk of experiencing preeclampsia, where the significance value is 0. 16. Meanwhile, the KEK variable shows that there is no significant influence on the incidence of preeclampsia when tested together with the variable age at pregnancy, this is proven by the significance value of 0.798. The magnitude of the relationship is shown by the Exponent Beta (Exp B) value of the age variable during pregnancy of 0.491, which means that pregnant women of at-risk age will experience preeclampsia 0.491 times more than pregnant women of no-risk age. Of the 2 independent variables, the variable age at pregnancy is the most dominant risk factor associated with the incidence of preeclampsia.

In an effort to avoid confounding factors, researchers included inclusion criteria, namely "not having multiple pregnancies" because this is included in the risk factors for preeclampsia, apart from that, there is also research data showing that DM, quality of service, and interest in checking pregnancy with an incidence of 0. As well as the existence of the unrelated variable is the family history variable.

The real situation in the field shows that the samples taken are related to several variables taken with an incidence of 0, such as DM, quality of health center services, and interest in pregnancy check-ups. This is also due to the data collection process being taken when prospective respondents come to the village health post or posyandu to have their pregnancy checked. Therefore, the relationship between these variables cannot be tested so that conclusions cannot be drawn as to whether or not there is a relationship with the incidence of preeclampsia.

The limitation of this research is that the data collection process is passive because it waits for pregnant women to come to the village health post to have their pregnancy checked who will

later become respondents. Pregnant women who were used as respondents were new patients (not repeat).

CONCLUSION

This study concluded that maternal age during pregnancy and chronic energy deficiency (CED) are significantly associated with the incidence of preeclampsia when analyzed as individual factors. However, when both variables were tested simultaneously using multivariate analysis, only maternal age showed a statistically significant influence. Therefore, maternal age at pregnancy emerged as the most dominant factor associated with preeclampsia in this study population. The suggestion that can be given is the need to improve the health service system for pregnant women, especially in terms of preventing pregnancy risks by campaigning for the ideal age for pregnancy, providing education related to nutrition for pregnant women and increasing the discovery of KEK mothers and providing PMT interventions in an effort to improve the nutritional status of pregnant women. In addition, it is also necessary to conduct screening on pregnant women with a family history of preeclampsia during ANC, as well as efforts to increase the coverage of KB use.

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