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Factors Related to The Incident of Preeclamsm in Pregnant Women in The Working Area of The Batujaya PUSKESMAS Karawang District

[1*]Jenny Anna Siauta, [2]Dessy Dian Permatasari, [3]Yenny Aulya

[1,2,3]Midwifery Study Program, Faculty of Health Sciences, National University of Jakarta

Corresponding Author: Jenny Anna Siauta, National University of Jakarta,

Jenny.siauta@civitas.unas.ac.id

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Abstract

Pre-eclampsia is the main cause of maternal and fetal death due to hypertension in pregnancy which is typical of pregnancy and is characterized by symptoms of edema, hypertension, and proteinuria that occur after 28 weeks of gestation and the cause is unknown. To determine the factors related to the incidence of preeclampsia of pregnancy in the Working Area of the Batujaya Health Center, Karawang Regency in 2024. This study used a case-control study design. The study population is mothers who live in the working area of the Batujaya Health Center and who conduct antenatal care examinations. The research sample used the total sampling technique and the inclusion and exclusion criteria, the number of samples was obtained from as many as 126 pregnant women with a 1:1 ratio of control cases. Medical records from the Maternal and Child Health (KIA) book and questionnaires. Data analysis using the Chi-Square test. The results of this study showed that there was a significant relationship between nutritional status p value=0.017, history of preeclampsia p value=0.001, diabetes p value=0.013, knowledge p value = 0.009 with the incidence of preeclampsia while multiple pregnancies had no relationship with the incidence of preeclampsia p value=1. There is a significant relationship between nutritional status, history of preeclampsia, diabetes, and knowledge of the incidence of preeclampsia while multiple pregnancies are not related to the incidence of preeclampsia in pregnant women in the Working Area of the Batujaya Health Center, Karawang Regency in 2024. Pregnant women need regular ANC examinations so that they can reduce the impact of complications so that if preeclampsia occurs, it can be treated quickly and appropriately.

Keywords: Diabetes, Multiple pregnancies incidence of preeclampsia knowledge, History of preeclampsia, Nutritional status.

Introduction

According to the World Health Organization (WHO), the incidence of preeclampsia ranges between 2% and 10% of pregnancies worldwide. About 1.8-16.7% of incidents are reported in developing countries, while in developed countries, the figure is 0.4% (Khan et al., 2022). In 2020, WHO estimated that there were 934 cases of preeclampsia occurring

worldwide every day. Around 342,000 pregnant women experience preeclampsia. The incidence rate of preeclampsia in Indonesia is estimated at 3.4% to 8.5%. In Indonesia, severe preeclampsia and eclampsia are the cause of maternal mortality ranging from 15-25% (Indonesia Health Profile, 2019). In West Java province in 2022, there were 20,352 pregnant women who experienced preeclampsia/eclampsia (West Answer Health Profile, 2023). According to data from the Karawang Regency Health Office, the incidence of pre-declaration in 2023 reached 1,338 cases and is the most common type of pregnancy complication after anemia cases. In the same year, at the Batujaya Health Center, the incidence of preeclampsia was 38 cases (Health Profile of Karawnag Regency, 2023).

Preeclampsia with or without severe deformity, is a pregnancy disorder associated with new hypertension, usually accompanied by proteinuria, which most often occurs after 20 weeks of gestation and often before term. The disease represents a spectrum of hypertension in pregnancy, starting with gestational hypertension and progressing to severe symptoms, which ultimately lead to more severe manifestations, such as eclampsia and HELLP (Haemolysis, Elevated Liver Enzyme, and Low Platelet) syndrome. The disease accounts for 2% to 8% of pregnancy-related complications, more than 50,000 maternal deaths, and more than 500,000 fetal deaths worldwide. Preeclampsia and eclampsia cause >50,000 maternal deaths annually worldwide (Karrar & Hong, 2023). The incidence of preeclampsia is increasing worldwide, and the prevalence of this condition is greater in developing countries compared to developed countries.

Preeclampsia is one of the serious health problems during pregnancy that can threaten the life of the mother and fetus. The specific syndrome is reduced organ perfusion due to vasospasm and endothelial activity which manifests as increased darag pressure and proteinuria. Preeclampsia can develop into moderate to severe preeclampsia, which can continue to be eclampsia. In severe conditions, preeclampsia can be accompanied by severe headache, visual impairment, cramping pain in the regiohypochondria, vomiting, sudden swelling of the face, legs, and hands (Lalenoh, 2018a). Preeclampsia has negative consequences on maternal and fetal health during pregnancy, including increased perinatal mortality, premature birth, small babies for gestational age, high rates of cesarean births, and other adverse effects even in the later postnatal period (Alonso-Ventura et al., 2020).

Preeclampsia is the leading cause of maternal and perinatal mortality and pain, especially in low- and middle-income countries. Several clinical risk factors for this

condition have been reported including nuliparity, prior history of preeclampsia, multiple pregnancies, diabetes, nutritional status/body mass index, and pre-existing diseases such as antiphospholipid antibody syndrome, chronic hypertension, and kidney disease (Lin et al., 2021).

Education can have an effect on the incidence of preeclampsia. Pregnant women with higher education have a wider knowledge of pregnancy and care, so they can prevent preeclampsia early. Health education about preeclampsia can also increase pregnant women's knowledge about the dangers of preeclampsia for the mother and fetus. Research by Bardja (2020) has proven that education levels are related to the incidence of preeclampsia (p-value: 0.000). Although the relationship between nutritional status and preeclampsia is not yet fully understood with certainty, some studies have shown that there is a correlation between certain nutritional status and preeclampsia risk. Deficiencies in certain nutrients, such as calcium, vitamin D, and magnesium deficiencies, have been linked to an increased risk of preeclampsia. Deficiencies in these nutrients can affect blood vessel function and blood pressure regulation, which can contribute to the development of preeclampsia.

The results of Aulya, Silawati, & Safitri (2021) also prove that nutritional status has a significant relationship with the incidence of preeclampsia. A history of preeclampsia in previous preeclampsia is one of the risk factors for preeclampsia. A literature review conducted by Utami, Utami, & Siwi (2020) revealed that the history of preeclampsia is related to the occurrence of preeclampsia.

In addition to these aspects, twin pregnancies (gemelli) and diabetes are also causes of preeclampsia. In multiple pregnancies, the incidence of preeclampsia is higher than that of single pregnancies and the overall rate is about 9.5%, or about two to three times the increased risk compared to single pregnancies. In addition, preeclampsia in twins is reported to occur at an earlier gestational age and has a more severe form. It has been suggested that the pathogenesis of preeclampsia in twin pregnancies may be due to a higher immunological response and placental mass (Chantanahom & Phupong, 2021). Uncontrolled diabetes before pregnancy can worsen health conditions during pregnancy, increasing the risk of preeclampsia. The risk of preeclampsia in mothers with diabetes mellitus is higher than in non-diabetic mothers which is only 2% to 7% incidence, the incidence of preeclampsia is diagnosed 15% to 20% in pregnant women with type I DM.

Also 10% to 14% in pregnant women with type II DM (Sugianto, 2023). The literature review research of Tendean & Wagey (2021) proves that DM has a significant relationship with preeclampsia.

Although many studies have been conducted to understand the factors that affect the incidence of preeclampsia, the incidence rate of preeclampsia is still high, especially in areas with limited access to adequate health services. The Batujaya Health Center, located in Karawang Regency, is one of the areas that needs special attention related to the incidence of preeclampsia. Factors such as the social, economic, and demographic environment may contribute to the high incidence rate of preeclampsia in the region. By understanding these factors, it is hoped that more effective prevention strategies and appropriate interventions can be developed to reduce the incidence of preeclampsia and improve maternal and fetal health in the region

Based on this, the researcher is interested in conducting a study with the title of factors related to the incidence of preeclampsia in pregnant women in the Batujaya Health Center Area, Karawang Regency. The purpose of this study is to determine the factors related to the incidence of preeclampsia in pregnant women in the Batujaya Health Center Area, Karawang Regency in 2024.

Method

The method of this research is observational analysis with a Case-Control approach. The population in this study is pregnant women in the second and third trimesters in the Batujaya Health Center Area, Karawang Regency, based on data from January – March 2024 as many as 126 pregnant women in the second and third trimesters. The sample in this study is pregnant women in the second and third trimesters in the Batujaya Health Center Working Area as many as 126 pregnant women. In the case-control study, a case sample and a control sample were used, namely 1:1 each of the results of the calculation of the research sample obtained by the number of samples divided into 63 pregnant women who experienced preeclampsia (case) and 63 pregnant women who did not experience preeclampsia (control), using the total sampling technique or saturated sampling. The variables of this study were the level of knowledge, nutritional status, history of hypertension, pregnancy disorders, and diabetes of independent variables and the incidence of preeclampsia of the dependent variables.

Result

1. Univariate Analysis

Respondent characteristics

Variable	Incidence of Preeclampsia				Total	
	Case		Control			
	n	%	n	%	n	%
Level of Knowledge						
- Less	14	22,2	3	4,8	17	13,5
- Good	49	77,8	60	95,2	108	86,5
Nutritional status						
- Less	24	38,1	11	17,5	35	27,8
- Good	39	61,9	52	82,5	91	72,2
History of preeclampsia						
- Yes	2	3,2	16	25,4	18	14,3
- Not	61	96,8	47	74,6	108	85,7
Pregnancy						
- Double	4	6.3	4	6,3	8	6,3
- Single	59	93,7	59	93,7	118	93,7
Diabetes						
- Diabetes	15	23,8	4	6,4	19	15,1
- Not	48	76,2	59	93,7	107	84,9
Sum	**63**	**100**	**63**	**100**	**126**	**100**

The table above shows that pregnant women in the control group as many as 60 (95.2%) have a good level of knowledge, while in the case group, as many as 14 (22.2%) have poor knowledge, pregnant women in the control group as many as 52 (82.5%) have good nutritional status while in the case group as many as 24 (38.1%) have poor nutritional status, pregnant women in the control group as many as 47 (74.6%) have no history of preeclampsia, Meanwhile, as many as 2 (3.2%) had a history of preeclampsia, pregnant women in the control group as many as 59 (93.7%) with single pregnancies, while in case of group 4 (6.3%) with multiple pregnancies, pregnant women in the control group as many as 59 (93.7%) did not have diabetes, while in the case group, as many as 15 (23.8%) had diabetes.

2. Bivariate Analysis

Analysis of factors related to the incidence of Preeclampsia

Sub Variables	Incidence of Preeclampsia				Total		P value	OR
	Yes		Not					
	n	%	n	%	n	%		
Level of Knowledge								
- Less	14	22,2	3	4,8	17	13,5	0,009	5,714
- Good	49	77,8	60	95,2	109	86,5		
Nutritional status								
- Less	24	38,1	11	17,5	35	27,8	0,017	2,909
- Good	39	61,9	52	82,5	91	72,2		
History of preeclampsia								
- Yes	2	3,2	16	25,4	18	14,3	0,001	0,096
- Not	61	96,8	47	74,6	108	85,7		
Pregnancy								
- Double	4	6.3	4	6,3	8	6,3	1	1
- Single	59	93,7	59	93,7	118	93,7		
Diabetes								
- Diabetes	15	23,8	4	6,4	19	15,1	0,013	4,609
- Not	48	76,2	59	93,7	107	84,9		
Sum	**63**	**100**	**63**	**100**	**126**	**100**		

The data in the table above shows the results of statistical tests using a significant level or p-value of < α 0.05, it was found that there was a relationship between the level of knowledge and the incidence of preeclampsia P value 0.009. There was a relationship between nutritional status and the incidence of preeclampsia P value 0.017. There was a relationship between the history of preeclampsia and the incidence of preeclampsia P value 0.0001. There was a relationship between diabetes and the incidence of preeclampsia, P value of 0.013. While multiple pregnancies were not associated with the incidence of preeclampsia p value 1

Discussion

1. Relationship of knowledge level with incidence of Preeclampsia

Based on the results of this study, it was shown that pregnant women who had more knowledge did not experience preeclampsia by 96.5% of good knowledge. Bivariate analysis showed that there was a meaningful relationship between knowledge and the incidence of preeclampsia, where pregnant women who had good knowledge were 5.714 times more likely not to experience preeclampsia than those who had less knowledge. Knowledge is the result of knowing, and this occurs after people sense a particular object.

Sensing occurs through the five human senses, namely: sight, hearing, smell, taste and touch. Knowledge or cognition is an important domain for the formation of a person's actions (Notoatmodjo, 2014).

Mothers' knowledge about pregnancy and child health is one of the supporting factors, the higher the knowledge, the wider the knowledge obtained. Pregnant women's knowledge is very important because it can help pregnant women in living their pregnancy well, as well as help mental readiness, prevent hypertension in pregnancy and the mother's physical in facing the delivery process. More and more information can affect or increase a person's knowledge. Knowledge gives rise to awareness that eventually, a person will behave or behave in accordance with the knowledge obtained from learning, experience or instruction. The attitude of a pregnant woman greatly determines the development of the fetus, if a mother is diligent in checking or controlling her health, checking blood pressure during pregnancy, then the mother can find out what happens or what happens later during pregnancy (Mustari *et al.,* 2022).

The results of this study are in line with Mustari *et al.,* (2022). Which states that knowledge can be said to be an experience that leads to intelligence and will increase interest and attention. So that the higher the level of knowledge of pregnant women about matters related to hypertension, it will be very helpful for the person concerned in behaving and acting positively. This study is in line with the results of Faiqoh's (2014) research, there is a relationship between the knowledge of pregnant women and the management of preeclampsia ($p = 0.033$). The information referred to in this study aims to increase maternal knowledge about preeclampsia so that it can prevent or avoid the continuation of preeclampsia.

According to the assumption, knowledge is very important for our lives, and knowledge about health and health problems is very influential for pregnant women, especially preeclampsia because preeclampsia can affect the mother and fetus so that socialization and information about the signs and symptoms of preeclampsia are needed so that mothers can detect it as early as possible.

2. Relationship between nutritional status and incidence of Preeclampsia

Based on the results of this study, it was shown that pregnant women who had more nutritional status did not experience preeclampsia by 82.5% of good nutritional status. Bivariate analysis showed that there was a meaningful relationship between nutritional

status and the incidence of preeclampsia where pregnant women who had good nutritional status had a 2,909 times chance of not experiencing preeclampsia compared to those who had poor nutritional status. The impact of poor nutritional status can increase the high risk of pregnant women, especially the increasing incidence of preeclampsia. During pregnancy, it is necessary to monitor calcium intake to reduce the occurrence of preeclampsia (Apriza, 2022).

The impact of poor nutritional status can increase the risk of high in pregnant women, especially the increasing incidence of preeclampsia. According to the theory, nutritional status is an expression of the state of equilibrium in the form of a definite variable or the embodiment of nutrients in the form of a certain variable. Poor nutrition will cause fetal growth to be disrupted either directly or by insufficient or indirect nutrition due to impaired placental function. Thus there will be competition between the mother, fetus, and placenta to get nutrients and this will affect the growth of the placenta and fetus which will have an impact on the birth weight of the baby and the weight of the placenta (Wulandari, 2016).

The results of this study are in line with the results of the research of Habibullah *et al,* (2023) based on the results of *chi-square* analysis and OR value that there is a relationship between the nutritional status of pregnant women and the incidence of preeclampsia P *value* = 0.002 Pregnant women with undernourished status are at risk of experiencing preeclampsia 5.133 times. According to Fransiska (2020), showing the results of 29 respondents with malnutrition status, there were 11 (19.0%). Based on the results of bivariate analysis with statistical tests using C*hi-Square*, the result of p was obtained. *value* = 0.000 means that the hypothesis states that there is a meaningful relationship between Nutritional Status and pre-eclampsia events is proven.

Research conducted by Anjel (2019) said that in the United States women of childbearing age showed that 24.5% of women aged 20-44 years had overweight nutritional status and 23% of them were obese. The results of this study reveal that mothers who do not experience obesity are not impossible to experience preeclampsia, this is possible there is a relationship between the nutrients contained in the food consumed by the mother, which although does not cause weight gain that makes the mother obese, but the food contains substances that are difficult to absorb by the body and settle in the blood vessels so that it blocks blood flow to the heart which causes the

mother's blood pressure to increase which triggers preeclampsia. In obese mothers, it is likely to consume foods that contain substances that are difficult for the body to absorb and digest, thus blocking blood flow to the heart which causes blood pressure in the mother to increase so that it can trigger preeclampsia.

According to the researcher's assumption, the nutritional status of preeclampsia mothers will undergo changes in the physical, including the cardiovascular system including the urinary system. If the mother has nutritional problems, it will cause problems for the mother and the fetus. The impact of poor nutritional status can increase the risk of pregnant women, especially the increasing incidence of preeclampsia. During pregnancy, it is necessary to monitor calcium intake to reduce the occurrence of preeclampsia.

3. Relationship between the history of hypertension and the incidence of Preeclampsia

Based on the results of this study, show that pregnant women who have a history of preeclampsia experience more preeclampsia 96.8% who have never experienced preeclampsia. Bivariate analysis showed that there was a significant relationship between the history of preeclampsia and the incidence of preeclampsia where pregnant women who did not have a history of preeclampsia had a 0.096 times chance of not experiencing preeclampsia compared to those who had a history of preeclampsia

A history of preeclampsia is a major risk factor that needs to be considered during antenatal visits for pregnant women. This factor is associated with a high incidence of severe preeclampsia, premature preeclampsia, and adverse effects on the perinatal. Women with a history of preeclampsia are a predisposing factor for preeclampsia, likely because the cardiovascular system cannot recover from preeclampsia, because women with recurrent preeclampsia have worse cardiovascular conditions than women after a normal pregnancy. Women with recurrent preeclampsia experienced increased intima-media carotid thickness, cardiac output, and left ventricular mass compared to normal pregnant women (Sudarman *et al.,* 2021).

The results of this study are in line with the research of Hasliani (2018) which stated that there was a relationship between the history of preeclampsia and the incidence of preeclampsia from the results of the bivariate analysis test, obtained from 36 respondents, 19 respondents who did not have a history of hypertension, as many as 15 respondents

had preeclampsia and 4 respondents did not experience preeclampsia. While 17 respondents with a history of hypertension, 3 respondents experienced preeclampsia and 14 respondents did not experience preeclampsia. From the results of the Chi-Square Test analysis, the value of $p=0.001 < \alpha = 0.05$ was obtained, which means that there was a significant relationship between the history of hypertension and preeclampsia in pregnant women.

Research Kartika *et al.,* (2017) One of the predisposing factors for severe preeclampsia is a history of preeclampsia, previous vascular hypertension disease, or essential hypertension. Hypertension suffered before pregnancy results in disorders/damage to important organs of the body. Pregnancy itself causes weight gain it can result in more severe disorders/damage, which is indicated by edema and proteinuria. From this data, the frequency of mothers who have a history of preeclampsia is very at risk of experiencing preeclampsia. To determine the relationship between preeclampsia history and preeclampsia using odd ratio and obtained a value of $p = 0.003$ and an OR value = 6.693 which can be concluded that there is a relationship between preeclampsia history and preeclampsia.

According to the researcher's assumption, a previous history of preeclampsia is related to the reaction or response of each pregnant woman's body. Every pregnant woman has a different response, so adaptation is needed to deal with pregnancy and subsequent childbirth. This factor can also be related to the psychological situation of the mother in previous pregnancies. If the previous psychological pressure is not able to be managed properly, it will have a bad impact on pregnancy and subsequent childbirth.

4. Relationship of multiple pregnancies with the incidence of Preeclampsia

Based on the results of statistical analysis, this study shows that multiple pregnancies with the incidence of preeclampsia with a statistical test obtained a p-value of 1, meaning that there is no significant relationship between multiple pregnancies and the incidence of preeclampsia. Mothers who experience twin pregnancies are at risk of developing preeclampsia. According to Winkjosastro's theory (2016), preeclampsia is more likely to occur in multiple pregnancies. In addition, hypertension is aggravated because pregnancies are common in multiple pregnancies. In terms of hyperplacentaosis theory, multiple pregnancies have a risk for developing preeclampsia, the incidence of preeclampsia in twin pregnancies increases to 4-5 times compared to single pregnancies.

This research is not in line with the research of Saputri (2021) who said that multiple pregnancies 5,135 times have a greater risk of pregnancy with preeclampsia than non-multiple pregnancies. This research is in line with Tendean research (2021) which said that multiple pregnancies 5,135 times have a greater risk of pregnancy with preeclampsia than non-multiple pregnancies.

Previous research conducted by Grum *et al.,* (2017) has identified that the incidence of preeclampsia is 8.22 times higher in mothers with multiple pregnancies compared to mothers without multiple pregnancies have a nearly triple risk of developing preeclampsia. In twin pregnancies there are greater cardiovascular changes, with more than one fetus being able to worsen the mother's physiological response to pregnancy.

According to the researcher's assumption, multiple pregnancies are at an increased risk of almost all pregnancy complications when compared to single pregnancies. Preeclampsia is more common in mothers who are pregnant with twins, the increased risk of preeclampsia in twin pregnancies is related to the mass of the larger placenta, and also the level of circulation of the placenta.

5. Relationship between diabetes and the incidence of Preeclampsia

Based on the results of this study, it shows that pregnant women who experience more diabetes do not experience preeclampsia by 93.7% do not have diabetes. Bivariate analysis showed that there was a meaningful relationship between diabetes and the incidence of preeclampsia, where pregnant women who did not have diabetes had a 4,609 times chance of not experiencing preeclampsia compared to those who had diabetes.

According to Nurhasanah (2017), it is proven that pregnant women with a history of chronic disorders such as diabetes and kidney disease have a 2 times very high prediction in the occurrence of preampsa from pregnant women who do not have a chronic history, because the placental blood flow has had problems before. Women are chronically disorderly and have the tragedy of high preeclampsia. Existing kidney problems increase the risk of obtaining a pregnancy which is detrimental to the increase in the risk of preeclampsia.

The results of this study are in line with the research conducted by Anna Rufaidah at RSU PKU Muhammadiyah Bantul in 2017, which found the results of the statistical test *chi square* p value = 0.030 which means that there is a significant relationship between diabetes and the incidence of preeclampsia in pregnant women (Ana, 2017). This

is in line with a study conducted by Dila, Rodiani and Risti at DR. H. Abdul Moeloek Lampung Hospital, in 2018 which stated that there was a critical relationship between diabetes and the incidence of preeclampsia with a p value = 0.018. These results explain that there is a significant relationship between obesity and the incidence of preeclampsia (Moeloek *et al*, 2019) Based on these results, it can be explained that diabetes is one of the factors that cause preeclampsia. This is done during pregnancy, the placenta plays a role in meeting all the needs of the fetus. Preeclampsia occurs in mothers with diabetes mellitus due to an increase in the production of deoxycorticosterone (DOC) produced from progesterone in the plasma blood and increases sharply during the third trimester (Kenny, et al, 2015)

The results of this study support the theory that obesity is one of the risk factors that cause pre-eclampsia/eclampsia. Diabetes mellitus is a hereditary disorder characterized by infection or absence of insulin in the blood circulation, high blood sugar concentrations, and reduced glycogenesis. Diabetes in pregnancy will cause a lot of difficulties.

The effects of diabetes in pregnancy are abortion and partus premature, hydramnion, preeclampsia, fetal misposition, and placental insufficiency. In mothers with diabetes mellitus, the pathophysiology is pure preeclampsia, but it is accompanied by primary renal/vascular abnormalities due to diabetes mellitus. In diabetes, there is a change in blood vessel permeability to protein, so that there is a lack of protein in the tissues. Extravascular proteins attract water and salts cause edema. Blood hemoconcentration that interferes with the body's metabolic function. Preeclampsia tends to occur in women who suffer from diabetes mellitus because diabetes is a disease that can be a triggering factor for preeclampsia. Almost 50% of diabetes mellitus that occurs in pregnant women develops into preeclampsia. Mothers with gestational diabetes have an increased incidence of hypertension and preeclampsia which will worsen the course of childbirth and increase the risk of type II diabetes later in life. Hypertension is often found in diabetic women with kidney disease so that they are at high risk of preeclampsia (Kenny *et al*, 2015),

According to the researcher's assumption, diabetes is related to the incidence of preeclampsia occurring due to a history of chronic disorders before it causes problems in the placental blood vessels before pregnancy. So that the value of the incidence of

preeclampsia will later increase in pregnant women who have chronic disorders such as DM and kidneys.

Conclusion

Based on the results of the research and discussion that has been carried out, it can be concluded that the factors related to the incidence of preeclampsia in pregnant women in the Batujaya Health Center Area, Karawang Regency in 2024 are as follows:

1. Most of the pregnant women in the second - third trimester were mostly with good nutritional status as many as 91 (72.2%), most had no history of preeclampsia as many as 108 (85.7%), most had a single pregnancy as many as 118 (93.7%), most did not have diphtheria as many as 107 (84.9%), most of them had good knowledge as many as 109 (86.5%)
2. There was a significant relationship between the level of knowledge, nutritional status, history of preeclampsia, diabetes, and the incidence of preeclampsia in pregnant women in the Batujaya Health Center Area, Karawang Regency
3. There is no relationship between multiple pregnancies and the incidence of preeclampsia in pregnant women in the Batujaya Health Center Area, Karawang Regency

References

1. Ahmad, A., & Jaya, I. (2021). Biostatistics: Statistics in Health Research. Jakarta: Kencana.
2. Akbar, M. I., Tjokroprawito, B. A., & Hendarto, H. (2020). Obstetrics and Gynecology Textbook Series. Surabaya: Airlangga University Press.
3. Alonso-Ventura, V., Li, Y., Pasupuleti, V., Roman, Y. M., Hernandez, A. V, & Pérez-López, F. R. (2020). Effects of Preeclampsia and Eclampsia on Maternal Metabolic and Biochemical Outcomes in Later Life: A Systematic Review and Meta-analysis. *Metabolism, 102*, 154012. Elsevier.
4. Armini. Ni Wayan, Sriasih, N. G. K., & Marhaeni, G. A. (2020). *Neonatal Midwifery Care, Infants, Toddlers & Preschoolers*. Yogyakarta: Andi.

5. Aulya, Y., Silawati, V., & Safitri, W. (2021). Analysis of Preeclampsia of Pregnant Women during the Covid-19 Pandemic at the Sepatan Health Center, Tangerang Regency in 2021. *Journal of Academic Baiturrahim Jambi*, *10*(2), 375–384.
6. Azizah, S. A., & Novrianti, I. (2022). Pharmacotherapy Of Diabetic Mellitus: A Review Review: Pharmacotherapy Of Diabetic Mellitus. *Journal Of Pharmacy and Science*, *5 (2)*, 80–91.
7. Bardja, S. (2020). Risk factors for the incidence of severe preeclampsia/eclampsia in pregnant women. *Embryo*, *12*(1), 18–30.
8. Candra, A. (2020). *Nutritional Status Check*. Semarang: Faculty of Medicine, Diponegoro University.
9. Chantanahom, N., & Phupong, V. (2021). Clinical risk factors for preeclampsia in twin pregnancies. *PLoS One*, *16*(4), e0249555. Public Library of Science San Francisco, CA USA.
10. Dahlan, M. S. (2014). *Statistics for Medicine and Health*. Jakarta: Salemba Medika.
11. Dumais, C., Lengkong, R. A., & Mewengkang, M. E. (2016). The relationship between obesity in pregnancy and preeclampsia. *e-CliniC*, *4*(1).
12. Fondjo, L. A., Awuah, E. O., Sakyi, S. A., Senu, E., & Detoh, E. (2023). Association between endothelial nitric oxide synthase (eNOS) gene variants and nitric oxide production in preeclampsia: a case–control study in Ghana. *Scientific Reports*, *13*(1), 14740. Nature Publishing Group UK London.
13. Gallo, G., Volpe, M., & Savoia, C. (2022). Endothelial dysfunction in hypertension: current concepts and clinical implications. *Frontiers in medicine*, *8*, 798958. Frontiers Media SA.
14. Gaspersz, E., Picauly, I., & Sinaga, M. (2020). The relationship between consumption patterns, history of infectious diseases, and personal hygiene with the nutritional status of pregnant women in the stunting locus area of North Middle East Regency. *Journal of Food Nutrition and Health*, *9*(2), 1081–1090.
15. Goulopoulou, S., de Groot, C., Taylor, R. N., & Davidge, S. T. (2022). Chapter 10 - Vascular Endothelial Cell Dysfunction in Preeclampsia. In R. N. Taylor, K. P. Conrad, S. T. Davidge, A. C. Staff, & J. M. Roberts (Eds.), *Chesley's Hypertensive Disorders in Pregnancy (Fifth Edition)* (pp. 187–218). Academic Press.

16. Gulati, D., Novak, A., & Stanworth, S. J. (2018). Common haemostasis issues in major bleeding and critical illness. *Clinical Medicine*, *18*(4), 320. Royal College of Physicians.
17. Handayani, S., Solama, W., & Hipson, M. (2023). Factors Associated with the Incidence of Preeclampsia in Pregnant Women. *Journal of Aisyiyah Medika*, *8*(1).
18. Irawati, D., Sari, D. P., Susani, D. P., & Primayanti, I. (2020). *Medical Research Textbook*. Mataram: Mataram University Press.
19. Isnaini, Y. S., & Simanjuntak, M. K. (2023). *Pregnancy Midwifery Care Textbook*. Pekalongan: NEM Publishers.
20. Janež, A., Guja, C., Mitrakou, A., Lalic, N., Tankova, T., Czupryniak, L., Tabák, A. G., et al. (2020). Insulin therapy in adults with type 1 diabetes mellitus: a narrative review. *Diabetes Therapy*, *11*, 387–409. Springer.
21. Karlina, N. K. D., Budiana, I. N. G., Surya, I. G. N. H. W., & Manuaba, I. B. G. F. (2020). The level of knowledge of pregnant women about preeclampsia at the Puskesmas II of South Denpasar. *Journal of Medika Udayana*, 9(8), 59–65.
22. Karrar, S., & Hong, P. L. (2023). *Preeclampsia*. StatPearls [Internet].
23. Kartika II. *Textbook on Basics of Nursing Research and Statistical Data Management.* Jakarta: Trans Info Media; 2017.
24. Kay, S., Sandhu, C. J., & Ocviyanti, D. (2022). *Crash Course Obstetrics and Gynaecology: Crash Course Obstetrics and Gynaecology*. Elsevier Health Sciences.
25. Khaidir, Nazaruddin, Nurainiah, Yalida, A., Siagin, N., Akyuni, Q., & Hawa, S. (2022). *Sociology of Islamic Education*. Aceh: Muhammad Zaini Publisher Foundation.
26. Khan, B., Yar, R. A., khan Khakwani, A., Karim, S., Ali, H. A., Khakwani, A., & Karim, S. (2022). Preeclampsia Incidence and its Maternal and Neonatal Outcomes with Associated Risk Factors. *Cureus*, *14*(11). Cureus.
27. Kliegman, R. M., & Geme, J. W. S. (2024). *Nelson Textbook of Pediatrics, 2-Volume - E-Book*. Elsevier Health Sciences.
28. Kontovazainitis, C.-G., Gialamprinou, D., Theodoridis, T., & Mitsiakos, G. (2024). Hemostasis in Pre-Eclamptic Women and Their Offspring: Current Knowledge and Hemostasis Assessment with Viscoelastic Tests. *Diagnostics*, *14*(3), 347. MDPI.
29. Kurniasari, D., & Arifandini, F. (2015). Relationship between Age, Parity and Diabetes Mellitus in Pregnancy with the Incidence of Preeclampsia in Pregnant Women in the

Working Area of Rumbia Health Center, Central Lampung Regency in 2014. *Holistic Journal of Health*, *9*(3).

30. Lakshmi, P. S., Shanmuga, P. V, Suganthy, K., & Kalaiselvi, K. (2020). A Study of Association of Insulin Resistance with Preeclampsia. *Journal of Evolution of Medical and Dental Sciences*, *9*(8), 527–532. Akshantala Enterprises Private Limited.
31. Lalenoh, D. C. (2018a). *Severe Preeclampsia and Eclampsia: Management of Perioperative Anesthesia*. Yogyakarta: Deepublish.
32. Lalenoh, D. C. (2018b). *Severe Preeclampsia and Eclampsia: Management of Perioperative Anesthesia*. Yogyakarta: Deepublish.
33. Lase, F., Nirwana, H., Neviyarni, & Marjohan. (2022). *Intelligent Character Education Learning Model*. Makassar: Nas Media Pustaka.
34. Lin, L., Huai, J., Su, R., Wang, C., Li, B., & Yang, H. (2021). Incidence and Clinical Risk Factors for Preeclampsia and Its Subtypes: A Population-Based Study in Beijing, China. *Maternal-Fetal Medicine*, *3*(02), 91–99. Chinese Medical Journals Publishing House Co., Ltd. 42 Dongsi Xidajie
35. Lopez-Jaramillo, P., Barajas, J., Rueda-Quijano, S. M., Lopez-Lopez, C., & Felix, C. (2018). Obesity and preeclampsia: common pathophysiological mechanisms. *Frontiers in physiology*, *9*, 1838. Frontiers Media SA.
36. Lucier, J., & Weinstock, R. S. (2023). *Type 1 Diabetes*. StatPearls [Internet].
37. Magley, M., & Hinson, M. R. (2023). *Eclampsia*. StatPearls [Internet].
38. Marasabessy, N. B., Nasela, S. J., & Abidin, L. S. (2020). *Prevention of Diabetes Mellitus (DM) Type 2*. NEM Publisher
39. Mardliyataini, Sulung, N., Dahliana, Kusumawaty, I., Paridah, Y., Retnosari, E., & Melitanti. (2022). *Pregnancy and Childbirth*. Malang: CV Literasi Nusantara Abadi.
40. Maria, I. (2021). *Diabetes Mellitus Nursing Care and Stroke Nursing Care*. Deepublish. Retrieved from
41. Martini, S., Dewi, R. K., & Pistanty, M. (2023). *Pregnancy Anemia: Care and Documentation*. Pekalongan: NEM Publisher
42. Moeloek A, Lampung P, January P, Aulia D, Graharti R, Medicine F, (2019). The Relationship between Diabetes Mellitus and the Incidence of Preeclampsia at DR Hospital. H. Relationship between Diabetes Mellitus with The Incidence of

Preeclampsia in RSUD DR . H . Abdul Moeloek Lampung on The Period. 2019; 8:180–6.

43. Nurasmi. (2021). *The Benefits of Omega 3 on Fetal Nutrition: A Study of Knowledge of Pregnant Women*. Indramayu: Adab Publisher.
44. Nurhayati, N., Khair, U., Amalia, R., Solama, W., Simanjuntak, H., Asih, F. R., Sulung, N., et al. (2023). *Pregnancy Midwifery Care*. Pekalongan: Global Technology Executive.
45. Opichka, M. A., Rappelt, M. W., Gutterman, D. D., Grobe, J. L., & McIntosh, J. J. (2021). Vascular dysfunction in preeclampsia. *Cells, 10*(11), 3055. MDPI.
46. Perdania, N. (2013). The level of knowledge of pregnant women about preeclampsia in Brujul Village, Central Java, Karanganyar in 2013. STIKES Kusuma Husada Surakarta.
47. POGI. (2016). PNPK Diagnosis and Management of Preeclampsia. 1–48
48. Priyoto (2019) *Attitude and Behavior Theory in Health*. Yogyakarta: Nuha Medika
49. Pudiastuti, R. D. (2022). *234 things about pregnancy & childbirth that mothers-to-be must know*. Great Child of Indonesia.
50. Putri, L. A. (2019). *Textbook of Obstetrics and Gynecology*. Gresik: Guepedia.
51. Ramadhani, R., & Bina, N. S. (2021). *Educational Research Statistics: Mathematical Computation Analysis and Application of SPSS*. Jakarta: Prenada Media Group.
52. Roberts, J. M., & Bell, M. J. (2013). If we know so much about preeclampsia, why haven't we cured the disease? Journal of Reproductive Immunology, 99(1–2), 1–9.
53. Ronitawati, P. (2020). *Nutritional Status Assessment Module*. Jakarta: Esa Unggul University.
54. Rufaidah, A., & Ery Khusnal, M. N. S. (2017). Factors related to the incidence of preeclampsia in pregnant women *at* PKU Muhammadiyah Bantul Hospital. *Doctoral dissertation*. Aisyiyah University of Yogyakarta).
55. Safirani, N. A. N., Fulyani, F., Wiyati, P. S., & Pramono, B. A. (2022). The difference of platelet-white blood cell ratio in severe preeclampsia and normotensive pregnancy. *Bali Medical Journal, 11*(1), 414–417. Sanglah General Hospital.
56. Sapra, A., & Bhandari, P. (2023). *Diabetes*. StatPearls
57. Sary, N. L., Rahmawati, S., Yusni, Y., Husnah, H., & Saminan, S. (2021). The relationship between food consumption habits and nutritional status of employees of the regional secretariat of West Aceh district. *Journal of Shia Kuala Medicine, 21*(1).

58. Savvina, I. A., Zabrodskaya, Y. M., Petrova, A. O., & Samochernykh, K. A. (2021). Cerebral Vasospasm: Mechanisms, Pathomorphology, Diagnostics, Treatment. In P. B. Ambrosi (Ed.), *Cerebrovascular Diseases* (p. Ch. 6). Rijeka: Intech Open.
59. Shaban, Raba Elsyaed et al, 2020. Knowledge, Attitude and Practice Regarding Calcium Intake Among Pregnant Women In Tanta City. Journal of Nursing and Health Science.
60. Shaikh, N., Nahid, S., Ummunnisa, F., Fatima, I., Hilani, M., Gul, A., Basha, A. Al, et al. (2021). Preeclampsia: From Etiopathology to Organ Dysfunction. In H. Abduljabbar (Ed.), *Preeclampsia* (p. Ch. 4). Rijeka: Intech Open.
61. Sohorah, S. (2024). *Textbook for Determining Nutritional Status*. NEM Publishers.
62. Sudarman, ., Tendean, H. M. M., & Wagey, F. W. (2021). Factors Associated with the Occurrence of Preeclampsia. e-CliniC, 9(1), 68–80.
63. Sugianto, K. R. (2023). The relationship between HbA1c levels in patients with diabetes mellitus and the incidence of preeclampsia. *Surabaya Biomedical Journal*, *2*(2), 85–92.
64. Sukchan, P., Liabsuetrakul, T., Chongsuvivatwong, V., Songwathana, P., Sornsrivichai, V., & Huang, M. (2018). Inadequacy of nutrients intake among pregnant women in the deep south of Thailand. BMC Public Health, 10(1), 572.
65. Sulung, N., & Yasril, A. I. (2020). *Introduction to Health Statistics (Biostatistics).* Yogyakarta: Deepublish.
66. Sumulyo, G., Iswari, W. A., Pardede, T. U., Darus, F., Puspitasari, B., Santana, S., Abidin, F., et al. (2017). The diagnosis and management of severe preeclampsia are independent of proteinuria. *Mirror of the Medical World*, *44*(8), 576–579.
67. Syaiful, Y., & Fatmawati, L. (2019). *Pregnancy Nursing Care*. Surabaya: Jakad Media Publishing.
68. Sylvia, I. L. A., Purwati, & Rukiyem. (2021). *Great Teachers in the Millennial Era*. Indramayu: Adab Publisher.
69. Tendean, H. M. M., & Wagey, F. W. (2021). Factors Related to the Occurrence of Preeclampsia. *e-CliniC*, *9*(1).
70. Utami, B. S., Utami, T., & Siwi, A. S. (2020). The relationship between history of hypertension and nutritional status and the incidence of preeclampsia in pregnant women: a literature review. *Journal of Maternity Nursing*, *3*(2), 22–28.

Wahyuni, I., & Aditia, D. S. (2023). *Maternal and Neonatal Emergency Textbook for Midwifery Students: Accompanied by Evidence Based Midwifery Services*. Salemba Publisher.

Wiknjosastro, H. (2017). *Midwifery* (2nd ed.). Jakarta: Bina Pustaka Sarwono Prawirohardjo Foundation.

Yang, Y., Wang, Y., Lv, Y., & Ding, H. (2022). Dissecting the roles of lipids in preeclampsia. *Metabolites*, *12*(7), 590. MDPI.

Yunawati, I., Setyawati, N. F., Muharramah, A., Dietisien, Y. E., Puspaningtyas, D. E., Wati, D. A., Puspita, L. M., et al. (2023). *Assessment of nutritional status*. Purbalingga: Eureka Media Aksara

Zulmiyetri, Nurhastuti, Safaruddin. (2019). *Writing Work Scientific*. Jakarta: Kencana;