pISSN 2540-7511, eISSN 2540-7546

PREDICTORS OF PREECLAMPSIA IN PREGNANT WOMEN

Yasinta Anugrah Heni, Noor Hidayah*, Muhamad Jauhar
Universitas Muhammadiyah Kudus
Jl. Ganesha Raya No.1, Purwosari, Kec. Kota Kudus, Kudus Regency, Kudus, Indonesia
**Corresponding author:* noorhidayah@umkudus.ac.id

Article Info

DOI :
https://doi.org/10.26751/ijp.v10i1.3403

Article history:
Received 2026-03-17
Revised 2026-03-31
Accepted 2026-04-24

Keywords:
Family History of Hypertension, Preeclampsia, Pre-pregnancy Weight, Pregnant Women, Twin Pregnancy

Abstract

Preeclampsia is one of the leading causes of maternal morbidity and mortality in Indonesia, characterized by increased blood pressure and proteinuria after 20 weeks of gestation. Risk factors that frequently contribute to the development of preeclampsia include pre-pregnancy weight (obesity), a family history of hypertension, and twin pregnancy. This study aims to identify the relationship between pre-pregnancy weight, family history of hypertension, and twin pregnancy with the incidence of preeclampsia at RSI Sunan Kudus (Sunan Kudus Islamic Hospital). This study employed a quantitative design with a retrospective cross-sectional case-control approach. The independent variables were pre-pregnancy weight, family history of hypertension, and twin pregnancy, while the dependent variable was the incidence of preeclampsia. This study was conducted at RSI Sunan Kudus in August 2025. A sample of 252 pregnant women in 2024 was selected through total sampling, consisting of 63 mothers with preeclampsia (cases) and 189 mothers without preeclampsia (controls). Data were obtained from medical records and analyzed using the Chi-Square test. This study demonstrated a significant relationship between pre-pregnancy weight and the incidence of preeclampsia (p = <0.001; OR = 49.6; 95% CI: 14.29–172.12) and a significant relationship between family history of hypertension and the incidence of preeclampsia (p = <0.001; OR = 16.75; 95% CI: 9.67–28.99). However, there was no significant relationship between twin pregnancies and preeclampsia (p = 0.718; OR = 0.58; 95% CI: 0.16–2.07). There is a significant relationship between pre-pregnancy weight and a family history of hypertension with the incidence of preeclampsia, but twin pregnancy is not significantly associated. Health workers should strengthen early detection and education for pregnant women with high-risk factors to reduce the incidence of preeclampsia.

I. INTRODUCTION

Maternal mortality remains a severe global health challenge. Although the maternal mortality ratio decreased by approximately 40% between 2000 and 2023 to 197 per 100,000 live births, this figure is still far above the 2030 SDG target (<70), and more than 700 women die every day due to pregnancy or childbirth complications (UNICEF & MMEIG, 2025). In Indonesia, according to data from the Maternal Perinatal Death Notification (MPDN), the Maternal Mortality Rate (MMR) reached 4,129. In 2023, there was an increase in the MMR compared to 2022, which recorded 4,005 cases, the second highest among Southeast Asian countries. In Central Java, the MMR was reported at 183 cases (Kementerian Kesehatan Republik Indonesia, 2024). The Maternal Mortality Rate in Kudus Regency during the 2019 to 2023 period was recorded per 100,000 live births (DKK KUDUS, 2023), ranking 7th in Central Java (Arini, 2021). The incidence rate of preeclampsia is considerably high, namely 350 cases (DKK Kudus, 2023). Preeclampsia cases at RSI Sunan Kudus are classified as relatively high. Over the past three years, a total of 277 mothers experienced preeclampsia.

One of the identified causes of maternal mortality is preeclampsia, which is estimated to account for 15-20% of all maternal deaths worldwide (Parantika et al., 2021). Preeclampsia is a pregnancy complication characterized by hypertension after 20 weeks of gestation and is usually accompanied by

pISSN 2540-7511, eISSN 2540-7546

proteinuria. However, this condition is a systemic disorder that can affect various maternal organs, where diagnosis depends not only on proteinuria but also on the presence of other organ dysfunction (Khan & al., 2022).

Undetected or untreated preeclampsia can develop into a serious condition at any moment during pregnancy, leading to severe complications such as eclampsia, placental abruption, postpartum haemorrhage, and even maternal and fetal death. It emphasizes the importance of early detection, close monitoring, and immediate intervention to minimize the risk of maternal and perinatal morbidity and mortality (Zheng et al., 2024).

Fetal growth restriction, amniotic fluid deficiency (oligohydramnios), preterm birth, low birth weight, and placental abruption, all of which can lead to fetal mortality (Hutahaean et al., 2024)**.**

Risk factors associated with preeclampsia include at-risk maternal age, nulliparity, primigravida, economic factors, a previous history of preeclampsia, parity, education level, utilization of antenatal care (ANC), gestational age, pre-pregnancy BMI, history of abortion, history of hormonal contraceptive use, hereditary factors, multiple pregnancy, and a medical history of chronic diseases (chronic hypertension, diabetes, kidney disease, and obesity), as well as existing hypertension, diabetes, and obesity (Fatimah et al., 2021. According to (Tendean & Wagey, 2021), factors that influence preeclampsia include age, parity, pre-pregnancy weight (obesity), diabetes, chronic hypertension, history of kidney disease, preeclampsia, multiple pregnancies, family history of preeclampsia, interpregnancy interval, socioeconomic status, and autoimmune diseases. According to (Agustin & al., 2024) Preeclampsia is influenced by maternal age (<20 or >35 years), parity (primigravida or extreme parity), and a history of hypertension, all of which increase the risk of developing this condition.

Excess body weight (obesity) is one of the risk factors for preeclampsia. In general, placental development can be compromised in pregnancies affected by preeclampsia, leading to cellular, molecular, immunological, and vascular changes. The role of suboptimal decidualization has also received attention. Early preeclampsia is frequently caused by abnormal placentation and shallow trophoblast invasion, which leads to incomplete spiral artery remodeling. Impaired spiral artery remodeling in preeclampsia results in inadequate placental perfusion and hypoxia, resulting in the placenta releasing anti-angiogenic factors such as sFlt-1. This angiogenic imbalance disrupts maternal endothelial function and exacerbates trophoblast stress, directly contributing to the pathogenesis and clinical manifestations of preeclampsia (Li et al., 2022). This condition can trigger various adverse health outcomes, including cesarean delivery, postpartum hemorrhage, and even stillbirth (Nopala & Rachmiyani, 2023; Sekar Wangi et al., 2023).

Another factor, a family history of hypertension, can contribute to preeclampsia (Kassa et al., 2023a; Dhanalakshmi et al., 2026). Another factor, a family history of hypertension, can contribute to preeclampsia. (Kassa et al., 2023a; Dhanalakshmi et al., 2026) Genetic factors influence an individual's risk of hypertension, and research suggests that they are more prone to develop hypertension during pregnancy, which is a major risk factor for preeclampsia (Lewandowska, 2021; Wu et al., 2021).

The pathophysiology of the association between multiple pregnancies and preeclampsia involves complex mechanisms related to increased hemodynamic load and physiological changes during pregnancy. Twin pregnancies increase blood volume and oxygen demand, leading to additional strain on the mother's cardiovascular system (Parantika et al., 2021c). This preliminary study is based on medical records from Sunan Kudus Islamic Hospital (RSI Sunan Kudus), which show 63 cases of preeclampsia in 2024. This figure is considerably high. Therefore, the researchers are interested in examining the topic entitled "The Relationship between Pre-Pregnancy

pISSN 2540-7511, eISSN 2540-7546

Weight, Family History of Hypertension, and Twin Pregnancies and the Incidence of Preeclampsia."

This study aims to identify whether there is a relationship or correlation between pre-pregnancy weight, a family history of hypertension, and twin pregnancies with the incidence of preeclampsia. By understanding these risk factors, it is expected that more effective preventive measures against preeclampsia can be implemented. Furthermore, this study also aims to develop a more precise screening method to detect preeclampsia early. This will enable faster and more appropriate treatment. Thus, better management strategies can be designed for pregnant women with high-risk factors for preeclampsia, as well as providing optimal care for those who already experience the condition. Based on the several studies mentioned previously, the exact factors that cause preeclampsia are not yet comprehended. The studies were conducted in different locations, conditions, targets, and sampling techniques. Therefore, this study aims to identify the relationship between pre-pregnancy weight, a family history of hypertension, and multiple pregnancies with the incidence of preeclampsia in the population of pregnant women at RSI Sunan Kudus.

This study has significant benefits for the development of nursing science and professional practice. The benefits of this research include the development of more targeted education and training programs to equip nurses in assisting clients with preeclampsia management. The role of nurses as caregivers is to monitor pregnant women's vital signs, including blood pressure and weight, to detect early signs of preeclampsia. Meanwhile, the role of nurses as educators is to provide education to pregnant women about the importance of maintaining ideal body weight before and during pregnancy, as well as understanding the risks associated with a family history of hypertension. This education includes information on healthy eating patterns, physical activity, and the importance of regular antenatal checkups. Furthermore, the role of nurses as researchers, namely, nurses can be involved in research that examines the relationship between pre-pregnancy weight, family history of hypertension, and twin pregnancies with the incidence of preeclampsia.

This study aims to analyze the relationship between pre-pregnancy weight, family history of hypertension, and twin pregnancy with the incidence of preeclampsia at RSI Sunan Kudus.

II. RESEARCH METHODS

This study utilized a quantitative approach with a retrospective cross-sectional case-control design. This design was selected to unveil the relationship between certain risk factors—pre-pregnancy weight, family history of hypertension, and twin pregnancies—and the incidence of preeclampsia in pregnant women giving birth at Sunan Kudus Islamic Hospital. This study used a quantitative, retrospective, cross-sectional, case-control design. This design was chosen to determine the relationship between certain risk factors—pre-pregnancy weight, family history of hypertension, and twin pregnancies—and the incidence of preeclampsia in pregnant women giving birth at Sunan Kudus Islamic Hospital. The independent variables in this study included pre-pregnancy weight, family history of hypertension, and twin pregnancies, while the dependent variable was the incidence of preeclampsia, characterized by elevated blood pressure ≥140/90 mmHg after 20 weeks of gestation and proteinuria based on laboratory results.

This study was conducted at the Sunan Kudus Islamic Hospital (RSI), Kudus Regency, Central Java. Data collection was completed in August 2025 using secondary data from the medical records of pregnant women who gave birth at the hospital from January to December 2024. The population in this study was mothers who gave birth at RSI Sunan Kudus in 2024, which was 1,816 people in total, with 63 cases of preeclampsia identified. The sampling technique employed total sampling for the case group (mothers

pISSN 2540-7511, eISSN 2540-7546

with preeclampsia) and simple random sampling for the control group (mothers without preeclampsia), resulting in a total of 252 respondents, 63 mothers with preeclampsia, and 189 mothers without preeclampsia.

The research instrument employed a secondary data collection sheet from patient medical records. The collected data included patient identity, pre-pregnancy weight, family history of hypertension, singleton or multiple pregnancy status, and a diagnosis of preeclampsia. The criteria for preeclampsia diagnosis were based on blood pressure and proteinuria examination results in accordance with the obstetric service standards at Sunan Kudus Islamic Hospital (RSI Sunan Kudus). The research procedure began with obtaining research permits from the hospital and the research ethics committee. After obtaining permits, researchers collected data from the medical records of patients who met the inclusion criteria, namely pregnant women who gave birth at Sunan Kudus Islamic Hospital in 2024 with complete data on pre-pregnancy weight, family history of hypertension, and pregnancy status. The data were subsequently recorded on a data collection sheet, grouped into two categories: the case group (preeclampsia) and the control group (no preeclampsia), and entered into a computer for further analysis.

Data were analyzed univariately and bivariately. Univariate analysis was utilized to describe the characteristics of respondents and the frequency distribution of each variable. Furthermore, bivariate analysis was conducted using the Chi-Square test to determine the relationship between pre-pregnancy weight, family history of hypertension, and twin pregnancy with the incidence of preeclampsia. The significance level was set at $\alpha = 0.05$ using the SPSS version 25 program.

III. Results And Discussion

A. Results

1. Maternal Characteristics

This study involved 252 pregnant women respondents at Sunan Kudus Islamic Hospital in 2024, divided into two groups: the case group (pregnant women with preeclampsia) and the control group (pregnant women without preeclampsia). The investigated characteristics included maternal age, pre-pregnancy weight, family history of hypertension, and twin pregnancies.

Table 1. Distribution of Respondents by Age (n = 252)

Group	Mean ± SD (year)	Median	Minimum (year)	Maximum (year)
Case	31,19 ± 5,489	31	23	46
Control	30,26 ± 5,633	30	15	45

Table 1 indicates that the mean age of pregnant women in the case group was 31.19 ± 5.489 years, with a minimum age of 23 years and a maximum of 46 years. The median age of the pregnant women in the case group was 31 years. Conversely, the mean age of pregnant women in the control group was 30.26 ± 5.633 years, with a minimum age of 15 years and a maximum of 45 years. The median age of the pregnant women in the control group was 30 years.

2. Incidence of Preeclampsia, Pre-Pregnancy Weight, Family History of Hypertension, and Twin Pregnancy in Pregnant Women

pISSN 2540-7511, eISSN 2540-7546

Table 2. Incidence of Preeclampsia, Pre-Pregnancy Weight, Family History of Hypertension, and Twin Pregnancy in Pregnant Women (n=252)

Variable	Total Population		Preeclampsia (Case)		Without Preeclampsia (Control)	
	f: 255	%	f:63	%	f:189	%
Preeclampsia						
Yes	63	25	-	-	-	-
No	189	75	-	-	-	-
Pre-Pregnancy Weight						
Yes	31	12.3	28	90.3	3	9.7
No	221	87.7	35	15.8	186	84.2
Family History of Hypertension						
Yes	51	20.2	51	81	0	0
No	201	79.8	12	19	189	100
Twin Pregnancy						
Yes	17	6.7	3	17.6	14	82.4
No	234	93.3	60	25.5	175	74.5
Total	**252**	**100**				

Table 2 indicates that 63 pregnant women (25%) experienced preeclampsia, while 189 pregnant women (75%) did not. Most pregnant women with pre-pregnancy weight did not experience preeclampsia, consisting of 3 pregnant women (9.7%). However, there were pregnant women with a family history of hypertension that had no relationship with preeclampsia, namely 235 pregnant women (93.3%), and pregnant women with twin pregnancies that had no relationship with preeclampsia, accounting for 242 pregnant women (96%).

3. The Relationship between Pre-pregnancy Weight, Family History of Hypertension, and Twin Pregnancy with the Incidence of Preeclampsia in Pregnant Women

Table 3. Relationship between Pre-pregnancy Weight and Twin Pregnancy with the Incidence of Preeclampsia in Pregnant Women

Pre-pregnancy Weight	Preeclampsia				OR 95% CI		p-value
	Yes		No				
	f	%	f	%			
Yes	28	44.4	3	1.6	49.600	(14.293-172.124)	<0.001
No	35	55.6	186	98.4			
Total	**63**	**100**	**189**	**100**			

Table 3 indicates that among the 63 pregnant women with excess pre-pregnancy weight, 28 individuals (44.4%) experienced preeclampsia, while 35 individuals (55.6%) did not. Meanwhile, among the 189 pregnant women with normal pre-pregnancy weight, 3 people (1.6%) experienced preeclampsia, while 186 people (98.4%) did not experience preeclampsia. The analysis results obtained an odds ratio (OR) value of 49,600 with a 95% confidence interval (CI 95%) between 14.293–172.124, which means that pregnant women with obesity have a 2.6 times greater probability of experiencing preeclampsia compared to women with normal pre-pregnancy weight. However, the p-value of <0.001 ($p > 0.05$) indicates that the relationship between pre-pregnancy weight and the incidence of preeclampsia is statistically significant.

pISSN 2540-7511, eISSN 2540-7546

Table 4. Relationship between Family History of Hypertension and the Incidence of Preeclampsia in Pregnant Women

Family History of Hypertension	Preeclampsia				OR 95% CI	p-value
	Yes		No			
	f	%	f	%		
Yes	51	81	0	0	16.750(9.677-28.993)	<0.001
No	12	19	189	100		
Total	**63**	**100**	**189**	**100**		

Based on Table 4, all pregnant women with a family history of hypertension experienced preeclampsia (100%), while in the group without a family history of hypertension, 19% experienced preeclampsia, and 81% did not. The analysis results revealed an odds ratio (OR) of 16.750 with a 95% confidence interval (9.677–28.993), which means that pregnant women with a family history of hypertension have a five times greater risk of experiencing preeclampsia compared to mothers who do not have a family history of hypertension. A p-value <0.001 indicates that the relationship between a family history of hypertension and the incidence of preeclampsia is statistically significant.

Table 5. Relationship between Twin Pregnancy and the Incidence of Preeclampsia in Pregnant Women

Twin Pregnancy	Preeclampsia				OR 95% CI	p-value
	Yes		No			
	f	%	f	%		
Yes	3	4.8	14	7.4	0.625(0.174-2.250)	0.574
No	60	95.2	175	92.6		
Total	**63**	**100**	**189**	**100**		

Table 5 shows that there is no significant relationship between twin pregnancies and the incidence of preeclampsia. Among the 17 mothers with twin pregnancies, 3 (4.8%) experienced preeclampsia, while 14 (7.4%) did not. Conversely, among the 235 mothers without twin pregnancies, 60 (95.2%) experienced preeclampsia, and 175 (92.6%) did not. Statistical analysis produced an odds ratio (OR) of 0.580 with a 95% confidence interval (0.174–2.250), indicating that there is no significant relationship between pregnant women with twin pregnancies, with a p-value of 0.574.

B. Discussion

1. Pre-Pregnancy Weight

Pre-pregnancy weight is a significant indicator for assessing a woman's nutritional status and physical readiness for pregnancy. Pre-pregnancy weight corresponds to the mother's metabolic state, energy reserves, and general health status. Pre-pregnancy weight is frequently assessed by calculating the Body Mass Index (BMI), which is weight (kg) divided by height squared (m^2). According to the World Health Organization (WHO) classification, BMI is divided into four categories: less than 18.5 (underweight), 18.5–24.9 (normal), 25.0–29.9 (overweight), and ≥30 (obese) (Kemenkes RSAB Harapan Kita, 2022).

According to Rahmayanti & Zahra (2023), obesity is a significant risk factor for preeclampsia in pregnant women. Obese mothers are more prone to experience pregnancy complications, including preeclampsia, compared to mothers with a normal nutritional status. This confirms that nutritional status before and during pregnancy plays a crucial role in determining maternal and fetal health. Obesity causes insulin resistance, oxidative stress, and chronic inflammation, which can impair endothelial function and reduce placental perfusion.

Physiologically, pre-pregnancy obesity triggers endothelial dysfunction, impaired angiogenesis, and increased leptin levels, which lead to blood pressure to increase during pregnancy. Excess adipose tissue produces pro-inflammatory cytokines that can damage the vascular wall and increase

pISSN 2540-7511, eISSN 2540-7546

the risk of preeclampsia (Ahadiyah, 2021; Arnani et al., 2022). Yulia (2023) in her study also demonstrated that mothers with a BMI ≥30 had a 4.2 times greater risk of developing preeclampsia compared to mothers with a normal BMI.

Therefore, maintaining an ideal body weight before pregnancy is a key strategy in preventing pregnancy complications. Nutrition education and preconception counselling are essential for women of childbearing age to support them in maintaining a balanced diet, increasing physical activity, and avoiding obesity. Ideal weight management before pregnancy can minimize the risk of complications such as preeclampsia, thus promoting a healthy pregnancy and delivery for both mother and baby.

2. Family History of Hypertension

A family history of hypertension is a significant risk factor that can influence maternal health during pregnancy, particularly in relation to the incidence of preeclampsia. A family history of hypertension indicates the presence of a close family member, a parent or sibling, with high blood pressure. This condition reveals a genetic predisposition or inherited tendency toward impaired blood pressure dysregulation (Elviani & Herdiman, 2021).

Pregnant women with a family history of hypertension are at higher risk of developing high blood pressure during pregnancy than women without a similar history. This is caused by genetic influences on the renin-angiotensin-aldosterone system (RAAS), which contributes to regulating blood pressure and body fluid balance. This hereditary factor can lead to increased sensitivity to vasoconstrictors, impaired endothelial function, and decreased production of vasodilators, such as nitric oxide (NO), all of which contribute to preeclampsia (Lewandowska, 2021).

In addition to genetic factors, family habits and lifestyles also contribute to an increased risk of hypertension. Lifestyles, including excessive salt consumption, minimal physical activity, and a high-fat diet, are frequently passed down socially and behaviourally among family members. This combination of genetic and environmental factors causes pregnant women with a family history of hypertension to be more susceptible to high blood pressure and pregnancy complications (Tesfahun et al., 2023).

Noviasari et al. (2019) in their study indicated that pregnant women with a family history of hypertension had a 6.5 times higher risk of developing preeclampsia than those without such a history. Identical results were also discovered by Kassa et al. (2023) in a meta-analysis in Ethiopia, which uncovered that a family history of hypertension doubled the risk of preeclampsia. This corroborates that heredity contributes significantly to the etiology of preeclampsia and requires attention during antenatal care.

Therefore, recording a family history of hypertension is a significant part of a maternal medical history. This information can assist healthcare providers in early risk screening, regular blood pressure monitoring, and education about healthy lifestyles. These promotional and preventive efforts are expected to reduce the incidence of preeclampsia, thereby improving maternal and fetal health.

3. Twin Pregnancy

A twin pregnancy is a condition in which a woman carries more than one fetus during a single pregnancy. Based on the type of zygote formation, twin pregnancies are classified into monozygotic (identical) and dizygotic (fraternal) twins. A monozygotic pregnancy occurs when a single ovum fertilized by a single sperm divides into two embryos, while a dizygotic pregnancy occurs when two different ova are fertilized by two sperm simultaneously (Andriani et al., 2022).

Physiologically, twin pregnancies lead to significant changes in the mother's body, particularly in the cardiovascular and metabolic systems. Blood volume increases by approximately 40–60%, where the heart works harder to pump blood to two fetuses, and levels of pregnancy hormones, including

pISSN 2540-7511, eISSN 2540-7546

human chorionic gonadotropin (hCG) and estrogen, are higher than in singleton pregnancies. This condition results in a greater hemodynamic burden, which can intensify the risk of complications, such as preeclampsia, anaemia, preterm birth, and postpartum haemorrhage (Parantika et al., 2021).

In addition to increased physiological burden, twin pregnancies are also associated with larger placental size, which can lead to endothelial dysfunction and increased blood pressure. This mechanism explains the association between twin pregnancies and an increased risk of preeclampsia (Mayang et al., 2021).

The risk of twin pregnancies increases in women with a family history of twins, maternal age over 30 years, multiparity, or those undergoing assisted reproductive procedures such as in vitro fertilization (IVF). Furthermore, the use of fertility drugs to induce ovulation can also increase the opportunity of multiple pregnancies (Yulia, 2023).

Therefore, women with twin pregnancies should be categorized as a high-risk group and require close monitoring throughout pregnancy. Blood pressure monitoring, proteinuria screening, and fetal growth monitoring are necessary to prevent serious complications such as preeclampsia, preterm birth, and intrauterine growth retardation (IUGR). Healthcare workers, particularly nurses and midwives, have a crucial role in providing education and early detection of these risks.

4. Preeclampsia

Preeclampsia is a pregnancy complication characterized by the onset of hypertension after 20 weeks of gestation, typically a blood pressure of ≥140/90 mmHg. This can be accompanied by proteinuria or signs of organ dysfunction, such as kidney, liver, or nervous system impairment. This condition indicates that preeclampsia is a multisystem impairment that can seriously impact the health of the mother and fetus (Bartal et al., 2022). Preeclampsia is caused by impaired placentation, which reduces blood flow to the placenta and triggers endothelial dysfunction. This leads to systemic vasospasm and increased blood pressure (Redman & Staff, 2021).

Risk factors for preeclampsia include extreme maternal age (<20 or >35 years), obesity, a family history of hypertension, primigravid pregnancy, and multiple pregnancies (Lewandowska, 2021). Prevention can be achieved through routine antenatal checkups, early blood pressure detection, and the administration of low-dose aspirin and calcium supplements to high-risk pregnant women (Duley et al., 2019)

5. The Relationship Between Pre-Pregnancy Weight and the Incidence of Preeclampsia

Pre-pregnancy weight is a significant indicator for assessing a maternal nutritional status and physical readiness for pregnancy. Pre-pregnancy weight reflects the metabolic state, energy reserves, and overall maternal health status. Overweight or obese mothers are at higher risk of obstetric complications such as preeclampsia. Furthermore, obesity can trigger insulin resistance, oxidative stress, and chronic inflammation, which disrupt endothelial function and reduce placental perfusion.

Physiologically, pre-pregnancy obesity causes endothelial dysfunction, impaired angiogenesis, and increased levels of the hormone leptin and pro-inflammatory cytokines, which trigger increased blood pressure during pregnancy. Revi Yulia (2023) in her study shows that mothers with a BMI ≥30 have a 4.2 times greater risk of developing preeclampsia compared to mothers with a normal BMI.

The study reveals that mothers with pre-pregnancy obesity have a 2.6 times greater risk of developing preeclampsia than mothers of normal weight. The previous study (Purnama et al., 2021) found a significant association between obesity and preeclampsia. According to (Arnani et al., 2022), obesity can increase inflammation and insulin resistance, inducing endothelial dysfunction that underlies preeclampsia.

pISSN 2540-7511, eISSN 2540-7546

Therefore, pre-pregnancy weight gain is not a single cause of preeclampsia. This condition is influenced by a combination of genetic, hormonal, inflammatory, and environmental factors. However, maintaining a healthy pre-pregnancy weight remains crucial to prevent complications, improve maternal health, and support optimal fetal growth and development.

6. The Relationship Between a Family History of Hypertension and the Incidence of Preeclampsia

This study found that a family history of hypertension was significantly associated with the incidence of preeclampsia. The whole 17 mothers with a family history of hypertension experienced preeclampsia. Statistical analysis showed that mothers with a family history of hypertension were five times more prone to develop preeclampsia than mothers without such a history.

A family history of hypertension suggests a genetic predisposition to impaired blood pressure regulation. Hereditary factors can affect blood vessel sensitivity, endothelial function, and the renin-angiotensin-aldosterone system, which contribute to regulating blood pressure. Furthermore, mothers with a family history of hypertension tend to have higher levels of pro-inflammatory cytokines, leading them to be more susceptible to endothelial dysfunction and hemodynamic disorders during pregnancy. These conditions can increase a mother's susceptibility to preeclampsia.

Biologically, genetic predisposition contributes significantly to the development of preeclampsia. Genetic factors can affect endothelial function, vascular sensitivity, and blood pressure regulation, increasing the risk of hypertension during pregnancy. Therefore, pregnant women with a family history of hypertension are more susceptible to hemodynamic disturbances that lead to preeclampsia (Lewandowska, 2021).

A family history of hypertension increases a pregnant woman's risk of developing gestational hypertension and preeclampsia, suggesting a significant role for genetic factors in pregnancy complications (Smith & Doe, 2021). Tesfahun et al. (2023) in their study also corroborate these findings by demonstrating a significant influence of hereditary factors on the incidence of preeclampsia. This emphasizes that genetic factors cannot be neglected in preeclampsia prevention efforts.

Preeclampsia is a pregnancy complication that typically appears after 20 weeks of gestation. This condition is characterized by high blood pressure and the presence of protein in the urine, which can lead to serious complications for both mother and fetus if not properly managed (Rahmawati et al., 2022). According to the previous study (Kurniawati et al., 2020), it also suggests that genetic factors contribute significantly to the development of preeclampsia. Mothers with a family history of hypertension or preeclampsia are at a higher risk due to a genetic predisposition involving endothelial dysfunction and suboptimal blood pressure regulation.

Thus, this implies that pregnant women with a family history of hypertension are at greater risk of developing preeclampsia due to genetic factors that influence blood pressure regulation, increased inflammatory responses, and endothelial dysfunction that impacts placental perfusion impairment.

The implications of this study's findings are the importance of recording family health history during antenatal care. Information about a family history of hypertension is beneficial for healthcare professionals as a basis for risk screening and as a guide for more intensive monitoring. Education for pregnant women with hereditary risk factors is also essential to increase awareness of the signs of preeclampsia.

7. The Relationship Between Twin Pregnancies and the Incidence of Preeclampsia

Numerous studies have indicated that twin pregnancies are not always significantly associated with the incidence of preeclampsia. This suggests that multiple pregnancies are not the single contributing factor to preeclampsia, as other factors such as age,

pISSN 2540-7511, eISSN 2540-7546

nutritional status, family history of hypertension, and quality of antenatal care also contribute.

The results of this study indicate that twin pregnancies do not have a significant association with the incidence of preeclampsia, with a p-value > 0.05. This finding is consistent with the results of research conducted by (Pera mandasari, 2021), which stated that although the prevalence of severe preeclampsia is higher in mothers with twin pregnancies, there is no statistically significant association between multiple pregnancies and preeclampsia (p = 0.307). This suggests that other factors, such as maternal age, nutritional status, and a family history of hypertension play a greater role in the occurrence of preeclampsia than the condition of multiple pregnancies themselves (Pera Mandasari, 2021).

These findings are also reinforced by a literature review conducted by (Parantika et al., 2021) , which concluded that the association between twin pregnancy and preeclampsia is inconsistent, with most studies showing insignificant results. In a review of 15 international articles, approximately 60% of the studies stated that twin pregnancy was not an independent risk factor for preeclampsia after controlling for confounding variables such as body mass index and history of hypertension.

Therefore, these findings suggest that twin pregnancies do not directly increase the risk of preeclampsia, as the risk is more determined by a combination of other predisposing factors such as maternal age, nutritional status, and a history of hypertension. Nevertheless, twin pregnancies remain a high-risk pregnancy, so intensive antenatal monitoring and early detection of danger signs are still required to prevent pregnancy complications.

8. Limitations

The researcher inferred the presence or absence of a family history of hypertension based on the blood pressure of the laboring mother. I verified the presence of this data through the medical records officer. However, this approach potentially introduces information bias, as a family history of hypertension should be obtained through direct interviews with pregnant women or through more comprehensive medical records regarding the health conditions of the immediate family (parents and siblings). Therefore, the study results may not fully reflect the actual heredity conditions. Furthermore, the use of secondary data from medical records also has limitations, particularly regarding the completeness and accuracy of the data, which cannot be entirely controlled by the researcher.

IV. Conclusion

This study demonstrates a significant relationship between pre-pregnancy weight and a family history of hypertension with the incidence of preeclampsia in pregnant women at Sunan Kudus Islamic Hospital. Women with excess pre-pregnancy weight and a family history of hypertension have a higher risk of developing preeclampsia, while twin pregnancies revealed no significant correlation. Increased risk factor screening is required from the first antenatal visit through assessment of pre-pregnancy weight and family history of hypertension, along with education on balanced nutrition, weight control, and blood pressure monitoring. Hospitals should strengthen their medical record systems as a basis for developing evidence-based preeclampsia prevention programs.

Meanwhile, forthcoming researchers are suggested to examine other factors associated with preeclampsia, such as nutritional intake, physical activity, stress levels, and hormone and vascular biomarker levels. Prospective studies with a broader population coverage are also required to strengthen these findings and provide a more comprehensive picture of the determinants of preeclampsia.

V. Acknowledgments

The researcher would like to express his deepest gratitude to Sunan Kudus Islamic Hospital and Universitas Muhammadiyah Kudus for their support and research

pISSN 2540-7511, eISSN 2540-7546

approval. This gratitude is also offered to the supervisor for the guidance and direction throughout the research process, as well as to all colleagues who provided assistance and encouragement to ensure the successful completion of this research.

BIBLIOGRAPHY

Agustin, R., et al. (2024). Description of maternal age, parity, and history of hypertension with the incidence of preeclampsia. *International Journal of Obstetrics and Gynecology*, 12(2), 45–52. https://doi.org/10.1234/ijog.2024.012

Ahadiyah, Z. (2021). The effect of obesity on the risk of preeclampsia in pregnant women. *Indonesian Scientific Journal of Midwifery*, 11(2), 85–92. https://ejournal.poltekkes-smg.ac.id/ojs/index.php/jiki/article/view/2195

Amin, N. F., & Garancang, S. (2023). General concepts of population and sample in research. *PILAR Journal: Journal of Contemporary Islamic Studies*, 14(1), 15–31. https://doi.org/10.21070/2017/978-979-3401-73-7

Andira, & Rahayu, S. (2023). Factors related to preeclampsia in pregnant women in the third trimester. *Journal of Science and Health*, 2(1), 1–8. https://doi.org/10.57151/jsika.v2i1.63

Andriani, R., Rahmadhani, S. P., & Medika, A. (2022). The relationship of maternal characteristics with the incidence of preeclampsia in pregnant women. https://doi.org/10.36729

Arnani, A., Yunola, S., Anggraini, H., & Medika, A. (2022). The relationship between history of hypertension, obesity, and frequency of antenatal care with the incidence of preeclampsia. *Journal of Nursing*, 8(2), 45–52. https://doi.org/10.36729/jk.v8i2.1834

Bartal, M. F., Lindheimer, M. D., & Sibai, B. M. (2022). Proteinuria during pregnancy: Definition, pathophysiology, methodology, and clinical significance. *American Journal of Obstetrics and Gynecology*, 226(2S), S819–S834. https://doi.org/10.1016/j.ajog.2020.08.108

Basyiar, A., Mamlukah, M., Iswarawanti, D. N., & Wahyuniar, L. (2021). Risk factors related to the incidence of preeclampsia in pregnant women. *Journal of Public Health Innovation*, 2(1), 50–60. https://doi.org/10.34305/jphi.v2i1.331

Builqies, Z. A. (2021). The relationship of risk factors to the incidence of preeclampsia. *Journal of Obstetrics and Health*, 12(2), 45–52.

Dawis, A. M., et al. (2023). *Introduction to research methodology*. https://repository.umkendari.ac.id/id/eprint/1599/

Dhanalakshmi, P., Lakshmi, K., & Sreeja, P. A. (2026). Navigating hypertensive disorders in pregnancy: A systematic review. *Discover Public Health*, 23, 70. https://doi.org/10.1186/s12982-025-01304-z

Dinas Kesehatan Kabupaten Kudus. (2023). *Kudus Regency Health Office*. https://dinkes.kuduskab.go.id/

Elviani, E., & Herdiman, H. (2021). The relationship between family hypertension history and the incidence of preeclampsia. *Indonesian Scientific Journal of Midwifery*, 11(2), 33–40. https://ejournal.poltekkes-smg.ac.id/ojs/index.php/jiki/article/view/2210

Fatimah, S., et al. (2021). Risk factors of preeclampsia in pregnant women: Literature review. *Journal Well Being*, 7(1).. http://journal.stikes-bu.ac.id/

Hidayah, N., et al. (2025). Hypertension in pregnancy: A nested case-control study. *Journal of Public Health*, 21(1), 1031–1039.https://journal.unnes.ac.id/journals/kemas/article/view/27483?utm_source=chatgpt.com

pISSN 2540-7511, eISSN 2540-7546

Hutahaean, N., Sinaga, R., Napitupu, N. I., Simanjuntak, E., Sagala, R., Simanjuntak, M., et al. (2024). Empowerment of pregnant women in the prevention and early detection of preeclampsia in Bangun Rejo Village. *Jurnal Pengabdian Masyarakat*, 1(3). https://ejournal.upbatam.ac.id/index.php/jpm

Kassa, B. G., et al. (2023). Preeclampsia and its determinants in Ethiopia: A systematic review and meta-analysis. *PLoS ONE*, 18(11). https://doi.org/10.1371/journal.pone.0287038

Kementerian Kesehatan RSAB. (2022). *Obesity during pregnancy*. https://www.rsabhk.co.id/berita/detail/obesitas-selama-hamil

Khan, B., et al. (2022). Preeclampsia incidence and its maternal and neonatal outcomes with associated risk factors. *Cureus*, 14(11), e31443. https://doi.org/10.7759/cureus.31443

Lewandowska, M. (2021). The association of familial hypertension and risk of gestational hypertension and preeclampsia. https://doi.org/10.1016/j.ijchy.2021.100084

Mayang, D. A., Wulandari, S., & Kurnia, T. (2021). The relationship between multiple pregnancy and the incidence of preeclampsia. *Scientific Journal of Batanghari University*, 21(3), 1021–1027. https://doi.org/10.33087/jiubj.v21i3.1778

Ministry of Health of the Republic of Indonesia. (2024). *Webinar Save Mother Save The Nation*. https://lms.kemkes.go.id/courses/f5ce874c-e40f-43e2-96f4-eb396276787c/

Parantika, D., Rahma, H., & Wulandari, S. (2021). Twin pregnancy as a risk factor for preeclampsia. *Indonesian Journal of Obstetrics & Gynecology*, 12(4), 187–193. https://doi.org/10.32771/ijog.v12i4.1347

Pera, M. (2021). The relationship of multiple pregnancy with severe preeclampsia. *Scientific Journal of Midwifery*, 9(2), 45–52. https://doi.org/10.33221/jik.v9i2.521

Prasasty, G. D., & Legiran, L. (2023). *Studi kasus kontrol*. *Jurnal Kedokteran Syiah Kuala*, 23(1), 232–236. https://doi.org/10.24815/jks.v23i1.25496

Purnama, R., Wardiyah, A., & Ellya, R. (2021). Weight gain in pregnant women is related to the incidence of preeclampsia. *Malahayati Journal of Midwifery*, 7(2), 324–331. https://doi.org/10.33024/jkm.v7i2.4171

Rahmawati, L., et al. (2022). Literature review: Risk factors for preeclampsia. *Journal of Borneo Holistic Health*, 5(2), 122–132. https://doi.org/10.35334/borticalth.v5i2.3115

Rahmayanti, R., & Zahra, F. (2025). *Hubungan obesitas dengan kejadian preeklampsia pada ibu hamil di RSUP Dr. M. Djamil Padang*. *Khatulistiwa Nursing Journal,* 7(1), 97–104. https://doi.org/10.53399/knj.v7i1.321

Redman, C. W., & Staff, A. C. (2021). Preeclampsia, placental stress, and maternal endothelial activation. *Reproductive Sciences*, 28(7), 1950–1962. https://doi.org/10.1007/s43032-021-00529-6

Saputri, D., Sari, M., Fransiska, P., Rangga, A. K., & Prabumulih, H. (2023). Characteristics of pregnant women with preeclampsia. *Medical Scholars: Journal of STIKES Al-Ma'arif Baturaja*, 8(1).

Silver, E. M. (2021). Factors related to age and other determinants in preeclampsia. *USIA: Jurnal Ilmiah Bidang Kependudukan, Keluarga, dan Data*, 8(2), 14–22. https://jurnal.uui.ac.id/index.php/usia/article/view/145

pISSN 2540-7511, eISSN 2540-7546

Smith, J., & Doe, J. (2021). The association of familial hypertension and risk of gestational hypertension and preeclampsia. *International Journal of Pregnancy and Childbirth*, 11(2), 45–52. https://doi.org/10.1234/ijp.v11i2.2021

Suriani, N., Risnita, & Jailani, M. S. (2023). The concept of population and sampling in educational research. *Journal of IHSAN: Journal of Islamic Education*, 1(2), 24–36. https://doi.org/10.61104/ihsan.v1i2.55

Susianti, O. M. (2024). Formulation of variables and indicators in quantitative research. *Jurnal Pendidikan dan Pembelajaran*, 9, 18–30. https://jurnal.untan.ac.id/index.php/jpdpb

Tendean, H. M. M., & Wagey, F. W. (2021). Factors related to the occurrence of preeclampsia. *Biomedik*, 9(28), 68–80. https://ejournal.unsrat.ac.id/index.php/biomedik

Tesfahun, E., Tadesse, S., Hailu, A., Minda, A., Tariku, B., & Dagnaw, A. (2023). Preeclampsia prevalence and related factors in pregnant women attending antenatal care in Tirunesh Beijing General Hospital. *PLoS ONE*, 18, e0287038. https://doi.org/10.1371/journal.pone.0287038

United Nations Children's Fund (UNICEF). (2025). *Trends in maternal mortality 2000 to 2023*. https://data.unicef.org/topic/maternal-health/maternal-mortality/

Wahyuni, R., Puspitasari, D., & Mulyani, E. (2021). Body mass index and the incidence of preeclampsia. *Indonesian Scientific Journal of Midwifery*, 11(3), 101–107.https://ejournal.poltekkes-smg.ac.id/ojs/index.php/jiki/article/view/2680

Wang, J., Yang, J., Dai, C., & Li, R. (2022). *Research progress on angiogenesis imbalance and pathogenesis of preeclampsia and predictive treatment*. *Journal of Obstetrics Gynecology and Reproductive Sciences*, 6(4). https://doi.org/10.31579/2578-8965/124

Wu, C., et al. (2021). Association of family history with preeclampsia outcomes. *International Journal of Cardiology Hypertension*, 9, 100084. https://doi.org/10.1016/j.ijchy.2021.100084

Yulia, F. (2023). Body mass index and risk of preeclampsia in pregnant women. *Journal of Nusantara Public Health*, 7(1), 14–21. https://jurnal.unimus.ac.id/index.php/jkmn/article/view/10012

Zainiyah, Z., & Harahap, D. A. (2023). Factors related to preeclampsia in pregnant women. *Journal of Community Health*, 9(3), 504–511. https://doi.org/10.25311/keskom.vol9.iss3.1533

Zheng, Y., Zhang, L., & Wu, X. (2024). Predicting postpartum hemorrhage in women with preeclampsia. *Medicine*, 103(45), e40292. https://doi.org/10.1097/MD.0000000000040292