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The Relationship of High-Risk Gestational Hypertension and Preconception Care with Hypertensive Disorders in Pregnancy: A Cross-Sectional Study

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ABSTRACT

Background: Hypertension during pregnancy contributes to severe maternal complications that can lead to death. According to the World Health Organization (WHO), approximately 80% of maternal deaths each day are caused by complications arising during pregnancy, childbirth, and the postpartum period. Findings in Jaddih Village show that out of 10 pregnant women with a gestational age of ≥20 weeks, two had a history of preeclampsia. A total of 30% had undergone preconception laboratory screening, including blood and urine tests; 100% had received TT immunization; and 50% had received information about healthy nutrition and pregnancy during consultations with midwives before planning their pregnancies. The prevention and control of risk factors can be initiated through high-risk gestational hypertension screening and premarital preconception care.
Objective: This study aims to analyze the relationship between high risk of pregnancy hypertension and preconception care with pregnancy hypertension.
Methods: This study used a cross-sectional design with a sample of 40 pregnant women. The sampling technique used was simple random sampling, and the data collection tools used were questionnaires, maternal and child health records, and mercury sphygmomanometers. Data analysis used the chi-square statistical test.
Results: Fewer than half of the pregnant women had adequate preconception care, and more than half were categorized as not being at high risk for gestational hypertension. Statistical testing demonstrated a significant association between preconception care and gestational hypertension (p-value <0.01).
Conclusion: High-risk conditions for gestational hypertension and preconception care affect the incidence of hypertension during pregnancy.

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INTRODUCTION

Pregnancy is a physiological process that can develop into a pathological condition that is dangerous to both the mother and the fetus. Hypertension is one of the most common complications of pregnancy. Hypertensive disorders during pregnancy can lead to serious complications such as increased fetal morbidity, fetal death in utero, premature birth, eclampsia seizures, intracranial hemorrhage, pulmonary edema, acute renal failure, and disseminated intravascular coagulopathy (DIC), which can result in maternal death. [1]. Preeclampsia is classified as pregnancy-induced hypertension, a condition in which the blood pressure of a pregnant woman is ≥140/90 mmHg after 20 weeks of pregnancy or in the early postpartum period, accompanied or not accompanied by proteinuria.[2].

The World Health Organization (WHO) reports that approximately 700 women die every day from complications of pregnancy and childbirth, with 99% occurring in developing countries. Approximately 80% of maternal deaths are related to complications of pregnancy, childbirth, and postpartum. Hypertension accounts for approximately 14% of maternal deaths, with an estimated 210 deaths per day worldwide. Preeclampsia contributes to 12% of these deaths [3]. In Indonesia, the prevalence of hypertension disorders in pregnancy is reported to be 1.51% in women aged 15–54 years, with a total of 8,341 cases. Among these cases, 1,062 cases (12.7%) occurred in pregnant women, and 125 cases (11.8%) were diagnosed by health workers. These findings indicate that hypertension is a significant maternal health problem, contributing to complications in 2–3% of pregnancies. [3].

In developed countries, the incidence of severe preeclampsia ranges from 6–7% and eclampsia from 0.1–0.7%. The WHO reports a prevalence of preeclampsia of 0.51%–38.4%, while in Indonesia, the figure ranges from 3.4%–8.5% [4] and increased to 9.4% in 2023. East Java Province recorded a prevalence of preeclampsia of 8.4% in 2023. In Bangkalan, preeclampsia accounted for 36.7% of mild cases and 63.3% of severe cases. A preliminary study of 10 pregnant women showed that 60% had normal blood pressure and 30% had high blood pressure. Among them, 70% were aged 20–35 years and 30% were ≥35 years. Two women with a gestational age of ≥20 weeks had a history of preeclampsia. A total of 30% underwent laboratory screening before pregnancy, 100% received TT immunization, and 50% received counseling on nutrition and healthy pregnancy. The exact causes of preeclampsia and eclampsia are still unclear. Some studies suggest that maternal age and a history of hypertension [5], as well as maternal characteristics such as occupation, age, and parity [6]. Hypertension during pregnancy is influenced by maternal age, education, stress management, weight gain, and family support [7]. Hilma M. (2017) found that most full-term pregnant women with hypertension (83.3%) received family emotional and instrumental support, while 16.7% lacked informational support. Adequate emotional support strongly contributes to the success of pregnancy. Counseling provides needed health information, and limited family support may worsen hypertensive disorders and maternal outcomes. [8][1].

Severe hypertensive complications include preeclampsia and eclampsia, also known as pregnancy toxemia, which threaten maternal and fetal life. Preeclampsia causes fetal death or miscarriage and occurs in about 5% of pregnancies, increasing to 10% in first pregnancies and up to 20–25% with prior hypertension. Preeclampsia leads to low birth weight, miscarriage, and preterm birth. Eclampsia occurs in 0.05–0.20% of pregnancies[9]. Hypertension narrows uterine vessels, limiting oxygen and nutrient flow to the fetus, slowing growth, and increasing the risk of placental abruption, which can cause severe bleeding, shock, and maternal–fetal death [10].

Because the exact etiology remains unknown, prevention focuses on modifying risk factors and controlling conditions that trigger preeclampsia. Early intervention includes high-risk pregnancy hypertension screening and preconception care before marriage. Effective management requires the involvement of pregnant women, family support, and health system policies. The government provides interventions through a minimum of four antenatal visits to detect risk factors and prevent complications such as preeclampsia.. Preconception care includes risk assessment, health promotion, disease prevention, and services to modify biological, behavioral, and social determinants to support a healthy pregnancy and delivery. Planned pregnancy affects fetal well-being and maternal physical and psychological adaptation [11]. Pregnancy preparation is important because pregnancy hypertension is greatly influenced by the mother's condition before pregnancy and the early stages of placenta formation. With preparation, risk factors can be detected and controlled earlier, thereby preventing hypertension and its complications. This

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study aims to analyze the influence of high-risk gestational hypertension and preconception care on hypertensive disorders in pregnancy.

METHOD

Study design and participants

This study used a descriptive analytical design with a cross-sectional approach. The study was conducted in Jaddih Village, Bangkalan District, from February to April 2025. The study population consisted of 44 pregnant women, and a sample of 40 pregnant women was selected using simple random sampling. Inclusion criteria included pregnant women with a gestational age of ≥20 weeks. Exclusion criteria included pregnant women with a history of chronic hypertension prior to pregnancy, severe comorbidities that affect blood pressure, inability to provide accurate information due to cognitive or mental disorders, and a history of using drugs that significantly affect blood pressure (such as antihypertensive drugs or certain stimulants). Independent variables included high risk of pregnancy-induced hypertension and preconception care, while the dependent variable was gestational hypertension.

Data collection instruments

Data collection instruments consisted of questionnaires designed to measure respondent characteristics and preconception care. The characteristics questionnaire included data on the mother's age, education level, and occupation. The preconception care questionnaire comprised items on preconception counseling, nutritional counseling, tetanus toxoid immunization for prospective brides, nutritional status assessment, weight assessment, urine assessment, and vital signs assessment. A high risk of pregnancy-induced hypertension was evaluated using the Maternal and Child Health Handbook (KIA), with high-risk criteria defined as the presence of ≥ 2 risk factors. Blood pressure was measured using a mercury sphygmomanometer, with gestational hypertension defined as blood pressure ≥140/90 mmHg. Blood pressure measurements were taken while pregnant women were in a sitting or semi-Fowler position. Preconception care variables were assessed using a questionnaire in which each item was rated dichotomously (1 = yes; 0 = no). The total score was calculated by summing all items and then converting them to a percentage of the maximum score. Preconception care levels were then categorized as “Good” (≥ 75%) and “Poor” (< 75%). The validity test employed Pearson's correlation with an R-table of 0.6021; the results yielded a correlation coefficient (r) of 0.7030, indicating instrument validity. The Cronbach's Alpha reliability test resulted in a value of 0.879.

Data analysis

Statistical analysis was performed using IBM SPSS Statistics 26. Data were described using descriptive statistics, including frequency tables. Data analysis used the chi-square test, with statistical significance set at $p < 0.05$.

Ethical Considerations

The research protocol was approved on January 24, 2025, by the Health Research Ethics Committee (KEPK) of Noor Huda Mustofa University, Indonesia (approval number: 2641/KEPK/UNIV-NHM/E/C/I/2025). This study adhered to the principles of the Declaration of Helsinki, including maintaining participant confidentiality, providing free funding (funded by the researcher), ensuring no harm was caused to participants, and respecting the right to withdraw at any time. Informed written consent was obtained from all participants. Participants received instructions before completing the questionnaire and the KIA book.

RESULTS AND DISCUSSION

Table 1. Distribution of Mother’s Age

NO	Maternal Age	N	(%)

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1	Early adolescence	3	7.5
2	Late adolescence	13	32.5
3	Early adulthood	24	60.0
	Total	40	100.0

Table 1 shows that most (60%) pregnant women in Jaddih Village are in the early adulthood category, with a small proportion classified as late adolescents (32.5%) and early adolescents (7.5%). Early adulthood is defined as between 20 and 30 years of age, which is considered the most optimal reproductive age in terms of reproductive organ function and psychological readiness compared to early adolescence (10-14 years) and late adolescence (15-19 years).

Table 2. Distribution of Maternal Education

NO	Maternal Education	N	(%)
1	Low	25	62.5
2	Medium	9	22.5
3	High	6	15.0
	Total	40	100.0

Table 2 shows that most pregnant women in Jaddih Village have a basic education (elementary school/Islamic elementary school), 62.5%, while only a few continue to higher education (bachelor's degree) 15% and have a secondary education (high school/vocational school), 22.5%. In general, the higher the level of education, the better the literacy and reproductive health behavior. This contributes to the prevention of pregnancy complications through early detection, adherence to antenatal care, and improved access to health services.

Table 3. Distribution of Maternal Occupation

NO	Maternal Occupation	N	(%)
1	Homemaker	23	57.5
2	Private sector	13	32.5
3	Civil servant	4	10.0
	Total	40	100.0

Table 3 shows that most pregnant women in Jaddih Village are housewives (57.5%), less than half (32.5%) work in the private sector, while only a small proportion work as civil servants (10%). The private sector in this study includes trading in markets and at home, as well as working as domestic helpers. In this context, occupational risks tend to be more pronounced in physically demanding and high-stress positions, such as those in the private sector (e.g., trading and domestic work), than in administrative roles, such as civil servants.

Table 4. Distribution of Preconception Care

NO	Preconception Care	N	(%)
1	Good	22	55
2	Poor	1	45
	Total	40	100.0

Table 4 This shows that more than half (55%) of preconception care for pregnant women in Jaddih Village was categorized as good, and less than half (45%) was categorized as poor. Preconception care in this study included preconception counseling, nutritional counseling, TT tests for prospective brides and grooms, nutritional status checks, as well as weight, urine, and vital sign checks..

Table 5. Distribution of High-Risk Hypertension in Pregnancy

NO	Pregnancy risk	N	(%)
1	High-Risk	17	43
2	No High-Risk	23	57
	Total	40	100.0

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Table 5 shows that more than half of pregnant women in Jaddih Village were classified as not being at high risk of developing hypertension during pregnancy, while less than half were categorized as being at high risk of developing hypertension during pregnancy. High-risk hypertension during pregnancy was measured using the Maternal and Child Health (KIA) Handbook owned by all respondents with ≥2 risk factors, indicating a high-risk category.

Table 6. Distribution of Gestational Hypertension

NO	Gestational Hypertension	N	(%)
1	Gestational Hypertension	16	40
2	No Gestational Hypertension	24	60
	Total	40	100.0

Table 6. This shows that a small proportion (40%) of pregnant women in Jaddih Village experienced gestational hypertension with blood pressure ≥140/90 mmHg, while the majority (60%) did not experience hypertension during pregnancy.

Table 7. Association of Preconception Care on the Incidence of Gestational Hypertension

NO	Preconception care	Gestational Hypertension					
		Gestational Hypertension		No Gestational Hypertension		Total	
		Frequency	Percentage	Frequency	Percentage	N	%
1	Good	3	13,6	19	86,4	22	100
2	Poor	13	72,3	5	27,7	18	100
	Total	16		24		40	100
p value <0,01 α=0,05		Odds Ratio =0,61					

Table 7 shows that pregnant women who received good preconception care mostly did not experience gestational hypertension, while only a small proportion experienced high blood pressure during pregnancy, in contrast to those who received inadequate preconception care, most of whom experienced gestational hypertension. Statistical analysis confirmed the significant effect of preconception care on the incidence of hypertension during pregnancy with a p-value <0.01 and an odds ratio (OR) = 0.61. Good preconception care showed a protective effect on the incidence of hypertension during pregnancy with an OR = 0.61. This indicates that mothers with good preconception care were 0.61 times less likely to experience hypertension during pregnancy compared to mothers who received poor preconception care.

Table 8. Association of High Risk with the incidence of Gestational Hypertension

NO	Risk	Gestational Hypertension					
		Gestational Hypertension		No Gestational Hypertension		Total	
		Frequency	Percentage	Frequency	Percentage	N	%
1	High Risk	15	88	2	22	17	100
2	No High Risk	1	4	22	96	23	100
	Total	16		24		40	100
p value <0,01 α=0,05		Odds ratio = 165					

Table 8 shows that almost all pregnant women who were not categorized as high risk did not experience hypertension during pregnancy. In contrast, among women classified as high risk, the majority experienced gestational hypertension. Statistical tests showed a significant effect of high-risk status on the occurrence of hypertension during pregnancy, with a p-value <0.01 and an odds ratio of 165. The high-risk group has 165 times higher odds of developing gestational hypertension compared to the non-high-risk group.

Association of Preconception Care on the Incidence of Gestational Hypertension

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These findings indicate that preconception care affects hypertensive disorders in pregnancy. Women with adequate preconception care mostly did not experience hypertension, and only a small number showed increased blood pressure, whereas in the poor preconception care group, most women experienced hypertension. Statistical testing demonstrated a significant association between preconception care and gestational hypertension (p-value <0.01). The odds ratio result of 0.61 shows that preconception care contributes to a reduced risk of pregnancy complications through early detection of risk factors, optimization of health status before conception, and increased maternal preparedness for pregnancy, including preconception counseling, nutritional counseling, TT tests for prospective brides and grooms, nutritional status checks, as well as weight, urine, and vital sign checks.

Preconception care is an important part of preventing hypertension during pregnancy. One of the measures that can be taken is the prevention of pregnancy-induced hypertension, which can be done during pregnancy planning by controlling blood pressure starting before pregnancy, especially in women who are overweight. This can be done by administering blood pressure lowering medication according to the dosage and under constant monitoring. Furthermore, counseling should be provided to women of childbearing age about the importance of controlling blood pressure and the importance of screening for hypertension before planning a pregnancy to determine the cause of hypertension. Next, encourage mothers to maintain their weight to avoid obesity and advise them to diet and maintain a healthy diet while reducing salt intake[12].

The high proportion of respondents receiving TT immunization is consistent with Yulivantina et al. (2021), who reported that prospective brides typically obtain TT vaccination prior to marriage, as proof of immunization is required. Low awareness of preconception screening contributes to limited involvement of future husbands in screening. Women knowledgeable about preconception screening often participate together with their partners. Additionally, women's education levels influence male partners' participation in screening services [13]. Preconception care supports achieving a healthy pregnancy. It includes physical examinations, nutritional interventions, lifestyle modification, infectious disease detection, immunization, diagnostic testing, and psychological services. Physical assessment during the preconception period includes vital sign measurement, weight monitoring, and mid-upper arm circumference to evaluate nutritional status [13]. Maternal weight before conception is a major contributor to pregnancy and childbirth complications. Women who are underweight during the preconception period have a 32% higher risk of preterm birth. In contrast, obese women have twice the risk of preeclampsia and gestational diabetes, with more severe obesity increasing preeclampsia risk more than twofold. Reproductive health forms the foundation for maternal and child well-being and should be supported early, even before pregnancy. Preconception health is an integral aspect of reproductive well-being for women and men. Preconception care aims to reduce risks and encourage healthy behaviors to promote optimal pregnancy outcomes. It involves preventive biomedical, behavioral, and social interventions intended to improve the likelihood of delivering a healthy infant. Screening programs have proven beneficial, positively impacting maternal and child health. Preventive, promotive, and curative interventions have been shown to be effective in improving maternal and child health [13]

Previous studies evaluating prediction and prevention strategies for preeclampsia often focus on assessments after the initiation of prenatal care, overlooking the role of preexisting health conditions or early gestational vascular changes. The preconception period and early pregnancy play a critical role in the development of hypertensive disorders of pregnancy. However, few studies have specifically measured early biomarkers of risk. Because blood pressure serves as a strong indicator of subclinical vascular dysfunction even in young adults who appear healthy and is routinely monitored in primary and prenatal care, preconception and early pregnancy blood pressure may be a valuable biomarker for early risk identification and intervention effectiveness [14]

Table 4 shows that a small proportion of respondents received inadequate preconception care, which may be due to their characteristics, as most of them had a basic education and were housewives, with a small number working in the private sector as farmers or traders. A person's behavior during the preconception period affects pregnancy. Education is closely related to knowledge, and the type of work, which can be a source of information, may be one of the characteristics related to pregnancy. Preconception preparation provides an opportunity for women and their partners to obtain education, examinations, and interventions targeting biomedical, behavioral, and social aspects before conception to address risk factors

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that may affect pregnancy. Scientific evidence shows that preconception interventions significantly increase the likelihood of a healthy pregnancy outcom[15]

Hartini (2022) found that educational status affects both awareness and utilization of preconception counseling services [16]. Preconception education is a key determinant of knowledge, attitudes, and behaviors in pregnancy preparation. As indicated in Figure 2, most pregnant women in Jaddih Village have secondary education, with only a few having higher education. Education facilitates the learning process; the higher a person's educational attainment, the more easily they process information. Knowledge may be obtained through both formal and non-formal learning sources [17]. Habte et al. (2021) identified maternal education, access to healthcare, availability of preconception services, and maternal knowledge as primary predictors of preconception care practices [18]. Age and parity are also linked to service utilization; women aged ≥30 years are more likely to participate than younger women, while multiparous women are less likely than primiparas to seek preconception care [19]. Figure 1 supports this finding as most pregnant women in Jaddih Village are in early adulthood, with only a small proportion in late adolescence.

Preconception care offers several benefits: (1) improved maternal and infant health, (2) reduced risks of preterm birth, short birth spacing, unintended pregnancies, and abortion, (3) decreased maternal and infant mortality and disability, reduced stillbirth, preterm delivery, and low birthweight, and increased healthy births, (4) improved maternal nutrition including management of obesity, malnutrition, and micronutrient deficiencies, (5) enhanced fertility, (6) increased awareness and engagement in men's reproductive health, (7) greater support for maternal mental well-being through counseling, (8) improved long-term health via detection and management of chronic disease, and (9) multigenerational social and economic benefits including women's empowerment and improved partner communication in decision-making [20][21]. In addition to reducing hypertensive disorders, preconception care plays a critical role in lowering the risk of congenital heart defects. Managing existing conditions such as diabetes, optimizing maternal weight, and avoiding teratogenic medications are important strategies to decrease congenital heart disease in newborns. Addressing these factors before conception can reduce the risk of such abnormalities [22]

Association of High Risk with the Incidence of Gestational Hypertension

Nearly all pregnant women who were not categorized as high risk did not develop hypertension during pregnancy. In contrast, among women classified as high risk, the majority experienced gestational hypertension. Statistical testing demonstrated a significant influence of high-risk status on the occurrence of hypertension in pregnancy, with a p-value <0.01. An odds ratio of 165 indicates a very strong association between high risk status and the occurrence of hypertension during pregnancy. These results show that maternal risk classification plays an important role in identifying groups that have a much greater chance of developing gestational hypertension.

The results of this study are consistent with those of Lisnawati (2024), who reported a p-value of 0.000 based on the chi-square test ($\alpha = 0.05$), indicating a significant relationship between high-risk pregnancy and preeclampsia at the Monano Health Center[16]. Early detection of high-risk pregnancy using the Maternal and Child Health Book (KIA) has proven effective in improving maternal knowledge regarding danger signs and preventing complications, including those related to hypertension. The KIA book functions as a tool for early identification of maternal and child health problems, as well as a medium for communication and counseling that provides essential information about health services, nutrition, immunization, and child development. Through its use, pregnant women are expected to receive comprehensive services, including high-risk screening [23]

Previous research findings on the high risk of developing gestational hypertension indicate that a small proportion of women who are not classified as high risk experience gestational hypertension, while the majority of women categorized as high risk are found to have the condition. The questionnaire results among high-risk respondents showed that many of them had a family history of preeclampsia, a history of chronic hypertension, nulliparity, or diabetes mellitus, and statistical tests have proven that a history of hypertension has a strong association with preeclampsia, with a p-value of 0.0001 (<0.05)[23]. A history of hypertension remains one of the most significant risk factors for preeclampsia, increasing the risk by 7.38 times compared to women without such a history [24]. Women with a family history of preeclampsia

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have a 6.74 times higher risk of developing hypertension during pregnancy. This supports the view that genetic factors contribute to preeclampsia through mechanisms such as abnormal trophoblast invasion, which can cause placental ischemia, a key element in the development of the disease [25]. A history of hypertension increases the likelihood of preeclampsia by 7.4 times, consistent with findings in Yogyakarta showing that women with previous hypertension have a significantly higher risk during pregnancy [24]

In this study, most participants were aged 25–40 years, categorized as early adulthood. A smaller number were younger than 25 or older than 35. Although age ≥35 years is typically recognized as a risk factor, these findings differ from previous assumptions regarding age-related preeclampsia risk. Even among women aged 20–35 years, other risk determinants such as obesity and prior hypertension were noted [24]. Likewise, Andika (2016) found a significant association between maternal age and gestational hypertension with $p = 0.016$ ($p < 0.05$). Pregnancy at both young and advanced maternal age increases the risk of complications due to immature or declining reproductive function [26].

The exact causes of early- and late-onset preeclampsia remain unclear. However, current theories relate to risk factors involved in the disease's pathophysiology. These include maternal characteristics such as age, parity, body mass index, multiple pregnancy, birth spacing, history of miscarriage, prior preeclampsia, and preexisting hypertension. Additional factors include nulliparity, chronic kidney disease, and assisted reproductive technology [27]. Other maternal contributors include primigravidity and nutritional deficiencies, particularly vitamin B12. Among risk predictors, advanced age is ranked first, followed by obesity (body mass index >25 kg/m²), parity, and chronic disease history [28].

Conclusion

High-risk gestational hypertension and preconception care affect the incidence of hypertension during pregnancy. The findings of this study are expected to serve as a reference for pregnant women and their families to recognize early risk factors for gestational hypertension. For health workers, this study can be used to develop interventions to improve understanding of the prevention and management of hypertension in pregnant women, especially those who experience hypertension during pregnancy.

Author Contributions

Novi Anggraeni designed and planned the study, collected data, and drafted the manuscript.
Kasiati contributed to data analysis and interpretation of results.
Sabrina Dwi Prihartini supervised the research process and contributed to the final approval of the published version.

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