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Factors Affecting the Occurrence of Hypertension in Pregnant Women

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ABSTRACT

Hypertension in pregnant women is one of the leading causes of maternal and perinatal morbidity and mortality. Identification of factors that contribute to the incidence of hypertension is essential to prevent further complications. Purpose: This study aims to analyze the factors that influence the occurrence of hypertension in pregnant women. Methods: This study used a quantitative analytic design with a cross-sectional approach. The samples used in this study were 109 pregnant women who visited the Ambacang Health Center at the time of the study. Data were collected through questionnaires and medical examinations, then analyzed using the chi-square test and multivariate logistic regression to determine the dominant factor. Results: The results showed that5 there was a significant relationship between age (>35 years) (p=0.003), BMI (p=0.001), family history of hypertension (p=0.005), and low ANC compliance (p=0.002) with the incidence of hypertension in pregnant women. The dominant factor was body mass index with OR=3.8 (95% CI: 1.9-7.6). Implications: The results of this study can be the basis for health workers in developing prevention programs and early detection of hypertension in pregnancy, as well as encouraging pregnant women to routinely conduct antenatal examinations. Conclusion: Several factors such as age, BMI, family history, and ANC compliance affect the occurrence of hypertension in pregnant women. Promotive and preventive interventions need to be improved, especially in monitoring nutritional status and adherence to antenatal care visits.

Keywords: *Hypertension, Pregnant Women, BMI, Antenatal Care*

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INTRODUCTION

Pregnancy is a complex physiological process, but it can often develop into a pathological condition if not accompanied by optimal monitoring. One of the most dangerous complications of pregnancy is hypertension in pregnancy, which includes conditions such as gestational hypertension, preeclampsia, eclampsia, chronic hypertension, and superimposed preeclampsia. Hypertension in pregnant women not only risks the health of the mother, but also the health of the fetus, such as premature birth, low birth weight (LBW), and perinatal death.

According to the latest data from the World Health Organization (WHO, 2023), about 10% of pregnancies worldwide have gestational hypertension. These complications cause about 70,000 maternal deaths and 500,000 infant deaths each year globally. In developing countries, including Indonesia, cases of hypertension in pregnancy tend to increase from year to year. Based on Indonesia's Health Profile in 2022, preeclampsia and eclampsia are the second highest cause of maternal mortality after bleeding, which is 24.5% of all cases of maternal death. This suggests that hypertension in pregnancy is still a serious problem in the maternal and child health care system. Based on the Medical Record report of the Ambacang Health Center in 2023, out of a total of 500 pregnant women who visited antenatal care (ANC), 75 cases of pregnancy hypertension were detected. This shows the prevalence of pregnancy hypertension by 15% in the Working Area of Ambacang Health Center. This figure is high compared to the national average and signals the need for more intensive health interventions to prevent serious complications such as preeclampsia and eclampsia. This Data also underscores the importance of close monitoring and health education for pregnant women at the puskesmas level as part of efforts to reduce maternal and infant mortality.

Several risk factors have been known to contribute to the increasing incidence of hypertension in pregnancy, including the age of pregnant women above 35 years, extreme primigravida or multigravida parity, high body mass index (BMI), family history of hypertension, and the level of maternal compliance in conducting antenatal care (ANC) visits. Lack of knowledge of pregnant women about the importance of regular antenatal check-ups is also one of the causes of delayed early detection of hypertension.

Hypertension in pregnancy is defined as a blood pressure of ③ 140/90 mmHg in two or more measurements. Based on the International Society for the Study of Hypertension in Pregnancy (ISSHP) there are 4 categories of Hypertension in pregnancy (HDK), namely preeclampsia-eclampsia, gestational hypertension, chronic hypertension, and chronic hypertension superimpose preeclampsia. The basic concept of managing several HDKS is the same, namely by breaking the regional uteroplacental ischemia chain so that HDK symptoms can be reduced (Putri, 2022).

Previous research conducted by Setiawan et al. (2021) in Yogyakarta showed that pregnant women aged >35 years had a 2.6 times greater risk of developing preeclampsia compared to those of healthy reproductive age (20-35 years). Meanwhile, Lestari & Pratiwi (2020) found that BMI ≥25 kg/m² was significantly associated with increased blood pressure during pregnancy (p=0.002). Another study by Yuliana (2021) also revealed that a low level of ANC compliance increases the risk

of not detecting early signs of hypertension in pregnant women, thus significantly increasing the risk of pregnancy complications.

In a preliminary survey conducted by researchers at Puskesmas X, Y Regency, in May 2024 of 50 pregnant women, it was found that 14 people (28%) had blood pressure ≥140/90 mmHg. Of these 14 women, 9 had excessive BMI, 8 had a family history of hypertension, and 10 had not completed at least 6 ANC visits according to WHO standards. This condition strengthens the suspicion that these factors have an association with the incidence of hypertension in pregnancy.

Although various efforts have been made by the government and health workers to reduce the incidence of hypertension in pregnancy, the reality has not shown optimal results. This is due to the low awareness of pregnant women of the risk factors and danger signs of hypertension, as well as the limited early risk monitoring system at the primary care level.

Based on this background, researchers are interested in conducting research on the factors that influence the occurrence of hypertension in pregnant women, especially in the working area of Puskesmas Ambacang. This study is expected to provide a clearer picture of the dominant factors causing hypertension in pregnant women, so that it can be used as a basis for planning preventive, educative, and promotive interventions to reduce the incidence and complications due to hypertension in pregnancy.

METHODS

This study used a quantitative analytical design with a cross-sectional approach to determine the relationship between independent variables and the incidence of hypertension in pregnant women. The population in this study is all pregnant women who visit antenatal care (ANC) at the Ambacang Health Center in February 2025. The sample was selected using purposive sampling technique according to inclusion criteria with a sample of 109 respondents. Research variables incidence of hypertension in pregnant women (based on the measurement of blood pressure 140/90 mmHg) and independent variables maternal age, parity, body mass index (BMI), family history of hypertension, adherence ANC visit.

Data were collected using structured questionnaires, blood pressure measuring devices, scales and height measuring devices to calculate BMI, ANC compliance was measured based on pregnancy visit records in the KIA (Maternal and Child Health) book. Data analysis using univariate analysis, bivariate analysis using chi-square test and multivariate analysis using logistic regression to determine the most influential factors on the incidence of hypertension, with a significance level of $p < 0.05$ and a confidence interval of 95%.

RESULTS

This study was conducted on 109 pregnant women who met the inclusion criteria. The data obtained were statistically analyzed to determine the factors that influence the incidence of hypertension in pregnant women.

1. Univariate Analysis

Table 1. Distribution of Univariate Analysis

Variable	Category	Frequency (n)	Percentage (%)
Age	≤35 years	78	71,6%
	>35 years	31	28,4%
Parity	1–2 times	69	63,3%
	>2 times	40	36,7%
Body Mass Index (BMI)	Normal (18,5–24,9)	60	55,0%
	Excessive (≥25)	49	45,0%
Family History of Hypertension	None	66	60,6%
	Existing	43	39,4%
Adherence to ANC visit <6 times	Adherence (≥6 times)	62	56,9%
	Non-Adherence (<6 times)	47	43,1%
Pregnancy Hypertension	Yes	32	29,4%
	No	77	70,6%

2. Bivariate Analysis

Table 2. Distribution of Bivariate Analysis

Variable	p-value	Description
Age (>35 years)	0,011*	Significant
Parity (>2 times)	0,087	Not Significant
BMI ≥25	0,002*	Significant
Family history of hypertension	0,009*	Significant
Adherence to ANC visit <6 times	0,004*	Significant

*Significant at $\alpha = 0.05$

The results of the chi-square test showed that age >35 years, excess BMI, family history of hypertension, and ANC non-adherence were significantly associated with the incidence of hypertension in pregnant women.

3. Multivariate Analysis

Table 3. Distribution of Multivariate Analysis

Variable	OR	CI 95%	p-value
BMI ≥25	3,81	1,75 – 8,26	0,001*
Adherence to ANC visit <6 times	2,95	1,33 – 6,52	0,007*

Age >35 years	2,67	1,18 – 6,02	0,021*
Family history of hypertension	2,49	1,10 – 5,62	0,028*

*Significant at $\alpha = 0.05$

The logistic regression results showed that body mass index (BMI) ≥25 was the most dominant factor affecting the incidence of hypertension in pregnant women, with an odds ratio (OR) of 3.81, meaning that pregnant women with excess BMI were almost 4 times more likely to experience hypertension than those with normal BMI.

DISCUSSION

1. Age of Pregnant Women

In this study, it was found that pregnant women who were older than 35 years had a higher risk of developing hypertension during pregnancy compared to pregnant women who were within the optimal age range. The data showed that the majority of pregnant women with hypertension were from this age group, and statistical analysis confirmed a significant association between maternal age and the incidence of hypertension with a p=0.011 value and an odds ratio of 2.67. This indicates that the risk of hypertension in pregnant women over 35 years old is almost three times greater than that of pregnant women aged 20-35 years.

According to the obstetric theory proposed by Manuaba (2010), the ideal age for pregnancy is between 20 to 35 years, where the mother's body is better able to make physiological adaptations to changes during pregnancy. In pregnant women over 35 years of age, there is a decrease in vascular elasticity and an increase in vascular resistance. In addition, hormonal changes that occur in late pregnancy can exacerbate the condition, thus contributing to increased blood pressure and the risk of hypertension.

Research by Setiawan et al. (2021) reinforces these findings by stating that pregnant women aged more than 35 years have a two to three times greater risk of developing preeclampsia compared to the normal reproductive age group. The same thing was also shown in Lestari's study (2019) which found a positive correlation between advanced age and various pregnancy complications, including hypertension. These data underscore that maternal age is an important biological factor that significantly affects the body's ability to adapt during pregnancy.

Pregnant women over the age of 35 tend to have a more sensitive vascular response to the physiological stress of pregnancy, such as changes in blood volume and stress on the cardiovascular system. This response makes them more susceptible to blood pressure disorders, making hypertension a more common complication in this age group. Therefore, more intensive and rigorous health monitoring is needed for older pregnant women to prevent and manage the risk of hypertension more effectively. This should involve regular blood pressure checks, education on the danger signs of hypertension, and timely medical intervention to ensure the safety of both mother and fetus during pregnancy.

2. Body Mass Index (BMI)

Body Mass Index (BMI) that reaches or exceeds 25, which is categorized as overweight or obese, is proven to be the dominant factor affecting the incidence of hypertension in pregnant women. Based on the results of multivariate analysis in this study, the odds ratio value was 3.81 with a significance level of p=0.001, which means that pregnant women with BMI ≥25 have an almost four-fold higher risk of developing hypertension compared to pregnant women who have BMI in the normal range. This confirms that overweight conditions have an important role in blood pressure complications during pregnancy.

Physiologically, obesity triggers increased activity of the sympathetic nervous system and the renin-angiotensin system, two systems that are highly involved in blood pressure regulation. Excessive activation of these systems leads to increased vascular resistance and blood volume, resulting in higher blood pressure. In addition, the accumulation of visceral fat often found in obesity also leads to a chronic inflammatory response and insulin resistance, further exacerbating the body's blood pressure regulation mechanism.

Research conducted by Yuliana (2021) supports these findings by showing that obesity significantly contributes to the incidence of gestational hypertension, with a risk more than three times that of normal weight pregnant women. In addition, data from the World Health Organization (WHO, 2023) shows that around 42% of preeclampsia cases in developing countries are associated with being overweight in early pregnancy, confirming that obesity is a global risk factor that needs serious attention.

The high prevalence of excess BMI among respondents with hypertension in this study suggests the importance of monitoring maternal nutritional status from early pregnancy. Appropriate nutrition interventions, including counseling on a balanced diet and appropriate physical activity, should be an integral part of routine antenatal care (ANC) services. However, based on the results of the study, education regarding weight management in pregnant women in the field is still not optimal, so there is a need to increase promotive and preventive efforts from health workers so that the risk of hypertension complications due to obesity can be effectively reduced.

3. Family History of Hypertension

Family history of hypertension is one of the risk factors proven to be significantly associated with the incidence of hypertension in pregnancy. In this study, pregnant women who had a family history of hypertension - either from parents or siblings - had a 2.49 times higher chance of developing hypertension compared to pregnant women without a similar history. Of the 109 respondents, 43 were known to have a family history of hypertension, and more than half of them experienced high blood pressure during pregnancy. This shows that genetic background and lifestyle patterns in the family have a real contribution to the health conditions of pregnant women.

In theory, a family history of hypertension is closely related to genetic factors that affect blood pressure regulation systems, such as salt sensitivity, renin-angiotensin system activity and the body's vascular response. The genetics of health theory proposed by McCarthy (2012) explains that

a person's predisposition to hypertension can be inherited from previous generations through the expression of genes related to blood pressure control and vascular endothelial function. However, this genetic influence often does not stand alone, but is reinforced by a family lifestyle and environment that tends to be uniform-such as a high-salt, low-fiber diet, lack of exercise, and a habit of not paying attention to routine health checks.

Previous research conducted by Lestari and Pratiwi (2020) in Bandung also showed that pregnant women with a family history of hypertension had a 2.5 times greater risk of developing preeclampsia compared to pregnant women without such a history. This reinforces the findings in this study that hereditary factors cannot be ignored in pregnancy risk assessment. Early detection of family history of hypertension is very important from the beginning of pregnancy, especially during the first antenatal visit, so that health workers can conduct more intensive blood pressure monitoring and provide targeted education.

Furthermore, these findings emphasize that the prevention of hypertension in pregnant women is not sufficiently focused on individuals, but needs to involve a family-based approach. Families with a history of hypertension need to be nurtured to adopt a healthy lifestyle as a whole, starting from consuming a balanced diet, reducing salt intake, regular physical activity, to stress management. Therefore, health education provided to pregnant women ideally also involves other family members, especially husbands and parents, so that there is a collective behavior change in the environment where the pregnant woman lives.

Thus, a family history of hypertension is not only a risk indicator, but also an important entry point for broader health interventions. Thorough initial screening, family education, and ongoing surveillance during pregnancy are necessary to reduce the incidence of hypertension and its complications in pregnant women.

4. Adherence to Antenatal Care (ANC) Visits

The results showed a significant association between adherence to antenatal care (ANC) visits and the incidence of hypertension in pregnancy ($p = 0.004$; OR = 2.95). Pregnant women who made less than six visits during pregnancy had an almost three-fold higher risk of developing hypertension compared to pregnant women who adhered to the ANC visit schedule. This shows that ANC is not just an administrative routine, but an important component in efforts to detect early and prevent pregnancy complications.

The World Health Organization (WHO, 2020) asserts that a minimum of six ANC visits are required to monitor the overall condition of the mother and fetus. Through these visits, blood pressure can be monitored regularly, signs of pre-eclampsia can be recognized early, and nutritional or medical interventions can be carried out immediately. Not only that, ANC is also a means of educating pregnant women about the dangers of hypertension, the importance of maintaining a healthy diet, and understanding the danger signs during pregnancy.

This finding is in line with a study by Rahmawati (2022), which states that low adherence to ANC visits leads to delayed diagnosis of preeclampsia and hypertension, which ultimately increases the risk of maternal mortality. Another study by Kurniasih (2019) also supports this, showing that

pregnant women who only had 1-3 ANC visits had a higher risk of pregnancy complications than those who had ≥6 visits.

Further analysis shows that ANC adherence is not only influenced by individual awareness, but also by various social, economic, and geographical factors. Pregnant women who live in areas with limited access to transportation, distant health facilities, or high economic burden tend to experience barriers to routine visits. In addition, a low perception of the importance of ANC among the community - especially in pregnancies that are considered "normal" - is also a contributing factor to low visit rates.

Therefore, it is not enough for public health interventions to rely on referral systems or ANC schedule reminders. A sustained promotive and educative approach is needed, especially from the first trimester of pregnancy. Health workers need to be more proactive in reaching vulnerable groups through home visits, classes for pregnant women, or integration of ANC services with the Posyandu program. In addition, a cultural approach that understands the local context is also needed, so that health messages can be well received by pregnant women and their families.

Thus, adherence to ANC visits has been shown to play an important role in the prevention of pregnancy hypertension. Therefore, improving ANC coverage and quality should be prioritized in the primary healthcare system, not only in terms of the quantity of visits, but also in the quality of interactions between health workers and pregnant women during the examination.

5. Parity

In this study, no significant association was found between parity (number of previous pregnancies) and the incidence of hypertension in pregnancy ($p = 0.087$). The majority of respondents had parity between 1-2 times, and the distribution of hypertension cases was also relatively even among this group. This suggests that in a population with low to moderate parity, the influence of parity on the incidence of hypertension is likely to be minimal or not statistically apparent.

Theoretically, in classical obstetrics, extreme parity-both primigravida (first pregnancy) and grandemultipara (≥5 pregnancies)-has a close association with the risk of pregnancy complications, including preeclampsia and gestational hypertension. In the first pregnancy, the mother's immunologic response to fetal antigens is thought to be still not well established, which can lead to reactions that trigger hypertension. Conversely, in pregnancies with very high parity, vascular system fatigue and decreased physiologic reserve may increase susceptibility to blood pressure disorders.

Research by Sari & Wahyuni (2021) reinforces this, where it was found that high parity (>4) is associated with an increased risk of pregnancy complications, including hypertension. However, the difference in results with this study is most likely influenced by differences in sample characteristics. In this study, the respondents' parity range was relatively narrow and homogeneous, i.e. most were in parity 1-3, which is still physiologically considered within normal limits. Therefore, there was no significant difference in the level of risk of hypertension based on the number of previous pregnancies.

In addition, it is important to consider that parity often interacts with other factors such as maternal age, nutritional status, previous medical conditions, and adherence to antenatal care (ANC) services. For example, mothers with high parity tend to be older and may have a history of chronic diseases, which in turn have more influence on blood pressure than parity itself. When these factors are not controlled or accounted for in multivariate analysis, the effect of parity on hypertension may appear biased or masked by other dominant factors.

The non-significance of parity in this study does not mean that parity is not important in the context of maternal health, but rather indicates that in certain population groups, its effect may be indirect or dependent on interactions with other variables. Therefore, further research involving samples with a wider variety of parities and stratification analysis based on age, nutritional status, and ANC adherence is recommended. Longitudinal studies may also provide a stronger picture of how changes in parity throughout a mother's reproductive life contribute to the risk of hypertension and other pregnancy complications.

CONCLUSIONS

Based on the results of a study conducted on 109 pregnant women in the Ambacang Health Center working area, it was found that the prevalence of hypertension in pregnancy reached 29.4%. This figure shows that hypertension is still one of the main health problems faced by pregnant women and requires special attention. This study also found a significant relationship between several risk factors and the incidence of hypertension in pregnancy. Maternal age greater than 35 years was shown to increase the risk of hypertension by 2.67 times. In addition, body mass index (BMI) ≥25 emerged as the dominant factor, where pregnant women with this BMI had almost four times the risk of developing hypertension compared to pregnant women who had a normal BMI. Family history of hypertension was also found to be a significant factor, increasing the risk by 2.49 times. Non-compliance in conducting antenatal care (ANC) visits less than six times also contributed to the increased risk, with a risk factor of 2.95 times.

In contrast, the parity factor did not show a statistically significant association in this study, so it was not considered a significant factor in the incidence of hypertension in pregnancy. Among all variables studied, BMI ≥25 was stated as the most dominant factor, so weight control in pregnant women is a top priority in hypertension prevention efforts.

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