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Factors associated with hypertension in pregnant women

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Abstract

Background: Hypertension in pregnancy is a major cause of maternal and neonatal morbidity and mortality, and is estimated to contribute to 10–22% of maternal deaths worldwide. The Simpang IV Sipin Community Health Center recorded the highest number of cases of hypertension in pregnancy in the city of Jambi in 2024, with a prevalence of 8%.

Purpose: To analyze the relationship between age, parity, history of hypertension, nutritional status (BMI), and stress levels with the incidence of hypertension in pregnant women.

Method: This study used an analytical observational research design through a case-control approach with a sample size of 80 people, consisting of 40 case samples and 40 control samples in the working area of the Simpang IV Sipin Community Health Center in Jambi City in 2025. Data analysis included univariate analysis with frequency distribution and bivariate analysis using the Chi-Square test.

Results: The study showed that there was no significant relationship between age ($p = 0.138$) and parity ($p = 0.101$). Meanwhile, a history of hypertension ($p = 0.001$), nutritional status (BMI) ($p = 0.040$), and stress levels ($p = 0.000$) were significantly associated with the incidence of hypertension in pregnant women.

Conclusion: There is a significant relationship between a history of hypertension, nutritional status (BMI), and stress levels. However, age and parity are not significantly related to the incidence of hypertension in pregnant women.

Suggestion: It is recommended to pay more attention to your health, undergo regular checkups, maintain a healthy diet, and manage stress during pregnancy.

Keyword: Hypertension; Hypertension in Pregnancy; Risk.

INTRODUCTION

Non-communicable diseases (NCDs) are a major challenge for global public health, including hypertension, which affects more than one billion individuals (Carolin, Safitri, Rukmaini, & Novelia, 2024). Non-communicable diseases (NCDs) are the leading cause of disability (Putra, Qomarania, Nugroho, Fitri, Sabaruddin, & Dhani, 2022). The issue of hypertension is a health challenge not only in Indonesia but also in almost all parts of the world (Halim & Sutriyawan, 2022). Among the serious and fatal diseases spreading throughout the world, high blood pressure plays an important role as a risk factor, since uncontrolled high blood pressure

contributes to high rates of morbidity and mortality (Pradono, Kusumawardani, & Rachmalina, 2020; Ekasari, Suryati, Badriah, Narendra, & Amini, 2021). The WHO notes that 1.28 billion adults suffer from hypertension (World Health Organization, 2023). Only 54% are diagnosed, 42% are treated, and only 21% successfully control it (Kario, Okura, Hoshide, & Mogi, 2024). The 2023 SKI data shows that 8.6% of the population aged ≥ 18 years has been diagnosed with hypertension, meaning that nearly one-third of adults have high blood pressure (Ministry of Health of the Republic of Indonesia, 2023). A person is categorized as having hypertension if their blood

pressure is $\geq 140/90$ mmHg. If not managed properly, hypertension in pregnant women can cause serious complications that ultimately contribute to an increase in the Maternal Mortality Rate (MMR) (Anggreni, Mail, & Adiasti, 2018).

According to the WHO Indonesia is among the countries with the highest Maternal Mortality Rates (MMR), both globally and in Southeast Asia, compared to other Asian countries (World Health Organization, 2023). Globally, hypertension contributes to 10–22% of maternal deaths (Palmer & Tong, 2020), while in Indonesia, the maternal mortality rate (MMR) due to hypertension is recorded at 14.6% (Ministry of Health of the Republic of Indonesia, 2022). In Indonesia, the MMR is 189 per 100.000 live births (Rejeki, Fitriani, Fatkhiyah, & Alifatimah, 2024). One of the biggest causes of maternal mortality is hypertension in pregnancy (Devi, Anwar, & Kartini, 2024).

Hypertension in pregnancy is a maternal health problem that has serious consequences for both the mother and the fetus (Laksono & Masrie, 2022). Hypertension in pregnant women is classified into four types, namely preeclampsia/eclampsia, chronic hypertension (appearing before pregnancy), chronic hypertension with preeclampsia, and gestational hypertension (appearing at or after 20 weeks of pregnancy) (Nurfitriyani & Amran, 2022).

Globally in 2021, the number of cases of hypertension in pregnancy was recorded at 3.51 million (Tang et al., 2025). In Indonesia, the 2018 Riskesdas recorded a prevalence of hypertension complications in pregnant women of 3.3%, increasing to 4.3% in the 2023 SKI data (Ministry of Health of the Republic of Indonesia, 2018; Ministry of Health of the Republic of Indonesia, 2023). These data show an increasing trend in cases of hypertension in pregnancy both globally and nationally.

Based on SKI data from 2023, the prevalence rate shows a similar trend in Jambi province, where hypertension during pregnancy was recorded at 1.2%. (Ministry of Health of the Republic of Indonesia, 2023). The highest number of cases was found in Jambi City (201 cases), followed by West Tanjab (109 cases) and Muaro Jambi (96 cases) (Jambi Provincial Health Office, 2023). The profile of the Jambi City Health Office shows fluctuations in HDK cases from 197 cases (8.5%) in 2022 to 201 cases (8.68%) in 2023, then decreasing to 173 cases (8.1%) in 2024.

Although HDP cases decreased in 2024, the situation remains serious in Jambi City because the number of cases is still relatively high.

As a health facility in Jambi City, the Simpang IV Sipin Community Health Center recorded the highest number of cases of hypertension in pregnancy in 2024, with a prevalence of 8% (40 cases) out of a total of 500 pregnant women. This was followed by the Paal Merah I Community Health Center, which reported a prevalence of 6.12% (15 cases) among 245 pregnant women, and the Aurduri Community Health Center, with a prevalence of 4.37% (19 cases) among 435 pregnant women.

The high prevalence of hypertension in pregnant women arises as a result of a number of interrelated risk factors. Maternal mortality is influenced by three groups of determinants, namely immediate, intermediate, and remote determinants. Proximal determinants refer to direct medical conditions such as hypertension in pregnancy, while intermediate determinants include factors that indirectly affect maternal health, such as mother's age, parity, history of hypertension, and nutritional status (BMI) (McCarthy & Maine, 1992). Stress levels are also included as intermediate determinants, based on modifications from the literature which states that stress in pregnant women can increase the risk of hypertension (Sari, 2017),

RESEARCH METHOD

This study used a quantitative analytical observational design with a case-control approach. It was conducted at the Simpang IV Sipin Community Health Center in Jambi City and began in October 2025. Two population groups were involved, namely the case group and the control group. The study population consisted of all pregnant women living in the working area of the Simpang IV Sipin Community Health Center in Jambi City in 2025, with a total population of 496 pregnant women. The case group included all pregnant women who were recorded as having hypertension during pregnancy between January and November 2025, based on data from the maternal and child health clinic register. The control group consisted of pregnant women who were not diagnosed with hypertension in the same year.

In this study, sampling was conducted using a 1:1 ratio, resulting in 40 people in the case group and 40 people in the control group, taking into account the

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Factors Associated with Hypertension in Pregnant Women

same age range and trimester of pregnancy for each case sample and control sample, so that the total sample reached 80 people. The sampling technique for the case group was total sampling, in which all 40 eligible cases were included in the study. Data collection was carried out through home visits to pregnant women who had been diagnosed with hypertension during pregnancy, as long as they met the inclusion criteria for the study. Meanwhile, the control group used the Non- Probability Sampling technique through the Accidental Sampling approach. The selection was made on mothers who did not have hypertension and were found by chance when visiting the Simpang IV Sipin Health Center, in accordance with the inclusion criteria.

The research instrument used in this study was a questionnaire. This questionnaire contained several structured questions to collect data on the relationship between age, parity, history of hypertension, nutritional status (BMI), and stress levels with the

incidence of hypertension in pregnant women. The statistical variable in this study used the DASS 42 (Depression Anxiety Stress Scales) questionnaire. Data collection in this study utilized primary data sources. The method used was a statistical interview with the help of a structured questionnaire that had been designed according to the indicators of the variables being studied.

Univariate analysis was conducted to address the specific objectives of the study, namely to determine the prevalence of hypertension in pregnant women and to describe the distribution of hypertension status, nutritional status (BMI), and stress levels among pregnant women. Subsequently, bivariate analysis was performed using the Chi-square test to identify statistically significant differences in proportions between groups, with a confidence level of 95% and an α value of 0.05 as the significance criterion.

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RESEARCH RESULT

Table 1. Respondent Characteristics (N=80)

Variabel	Case N=40	Control N=40
Gestational Age (n/%)		
First Trimester	0/0	0/0
Second Trimester	22/55.0	27/67.5
Third Trimester	18/45.0	13/32.5
Education (n/%)		
Elementary School	4/10.0	0/0
Junior High School	3/7.5	3/7.2
Senior High School	15/37.5	17/42.5
Bachelor's degree	17/42.5	19/47.5
Master's/Doctorate Degree	1/2.5	1/2.5
Occupation (n/%)		
Civil/Military/Police/State-Owned	4/10.0	6/15.0
Enterprises (SOEs)	0/0	0/0
Private Sector Employees	2/5.0	3/7.5
Self-employed	2/5.0	0/0
Not Working	27/67.5	22/55.0
Other	5/12.5	9/22.5

Based on Table 1, the most common gestational age category was the second trimester, with 22 respondents (55.0%) in the case group and 27 respondents (67.5%) in the control group. Regarding education level, the majority of respondents had completed a diploma (D3/D4) or bachelor's degree, accounting for 17 respondents (42.5%) in the case group and 19 respondents (47.5%) in the control group. In terms of employment status, most respondents were unemployed, comprising 27 respondents (67.5%) in the case group and 22 respondents (55.0%) in the control group.

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Table 2. Relationship Between Age, Parity, History of Hypertension, Nutritional Status (BMI), and Stress Levels With the Incidence of Hypertension in Pregnant Women

Variable	Hypertension		OR	(95%CI)	P-Value
	Case (n=40)	Control (n=40)			
Age (Mean±SD) (Years)					
At Risk (<20 and >35)	15/37.5	8/20.0	2.400	0.879-6.556	0.138
Not At Risk (20–35)	25/62.5	32/80.0			
Parity (n/%)					
At Risk (≥ 3 times)	18/45.0	10/25.0	2.455	0.950-6.339	0.101
Not At Risk (<3 times)	22/55.0	30/75.0			
History of Hypertension (n/%)					
Yes	24/60.0	8/20.0	6.000	2.207-16.313	0.001
None	16/40.0	32/80.0			
Nutritional Status (BMI) (n/%)					
At Risk (BMI <18.5 kg/m ² and ≥25.0 kg/m ²)	29/72.5	19/47.5	2.914	1.149-7.393	0.040
Not At Risk (BMI 18,5 – 24,9 kg/m ²)	11/27.5	21/52.5			
Stress Level (n/%)					
Stress (score >14)	32/80.0	8/20.0	16.000	5.349-47.858	0.000
Normal (Score ≤14)	8/20.0	32/80.0			

Based on Table 2, in the case group, 15 of 40 pregnant women (37.5%) were classified as at risk based on maternal age, while 25 respondents (62.5%) were classified as not at risk. In the control group, 8 out of 40 respondents (20.0%) were classified as at risk, whereas the majority, 32 respondents (80.0%), were classified as not at risk. The analysis results showed an OR value of 2,400 with a 95% CI of 0.879–6.556, indicating a higher likelihood of hypertension among pregnant women in the at-risk age category compared with those in the not at-risk category. However, this association did not reach statistical significance ($p = 0.138$).

In the case group, 18 of 40 pregnant women (45.0%) had parity ≥3 times and 22 respondents (55.0%) had parity <3 times, while in the control group, 10 of 40 pregnant women (25.0%) had parity ≥3 times and 30 respondents (75.0%) had parity <3 times. The results of the analysis showed an OR value of 2,455 with a 95% CI range (0.950–6.339), indicating that pregnant women classified as at risk were approximately 2,455 times more likely to

develop hypertension than those classified as not at risk. However, this relationship was not statistically significant, as indicated by a p-value of 0.101 ($p > 0.05$).

In addition, 24 pregnant women (60.0%) in the case group had a history of hypertension, while 16 (40.0%) did not. However, in the control group, 8 pregnant women (20.0%) had a history of hypertension, while 32 (80.0%) did not. The analysis results showed an OR value of 6.000 with a 95% CI range (2.207–16.313), indicating that pregnant women with a history of hypertension had 6 times higher odds of developing hypertension during pregnancy compared to those without a history of hypertension. This association was statistically significant, as indicated by a p-value of 0.001 ($p < 0.05$).

In the case group, most pregnant women were classified as having BMI at risk, accounting for 29 respondents (72.5%), while 11 respondents (27.5%) were categorized as BMI not at risk. In contrast, in the control group, 19 pregnant women (47.5%) were

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included in the at-risk BMI category, whereas 21 respondents (52.5%) were classified as not at risk. The statistical analysis yielded an OR value of 2.914 with a 95% CI of 1.149–7.393, indicating that pregnant women with BMI at risk had higher odds of developing hypertension compared to those with BMI not at risk. This association was statistically significant, as shown by a p-value of 0.040 ($p < 0.05$).

In the case group, most pregnant women were identified as experiencing stress, with a total of 32 respondents (80.0%), while 8 respondents (20.0%) were categorized as having normal stress levels.

DISCUSSION

The findings of this study indicate that the age group of mothers is not significantly associated with hypertension during pregnancy. Statistical tests produced a p-value of 0.138 (>0.05), with an OR of 2.400 and a 95% confidence interval (0.879–6.556). This indicates that pregnant women of risk age are 2.4 times more likely to experience hypertension than pregnant women of non-risk age, but this relationship is not statistically significant.

However, in theory, age is one of the determinants related to reproductive status and the biological condition of the mother (McCarthy & Maine, 1992). The best age range for pregnancy is 20–35 years. In young pregnancies, the reproductive organs and cardiovascular system are not yet fully developed. Meanwhile, in older pregnancies, blood vessel elasticity decreases and the potential for metabolic disorders increases, which can trigger an increase in blood pressure during pregnancy (Sulistiani & Azizah, 2024).

Research conducted by Carolin et al. supports the theory that there is a significant association between maternal age and hypertensive disorders in pregnancy, as indicated by a p-value of <0.001 and an odds ratio (OR) of 11.667 (95% CI: 4.145–32.835) (Carolin et al., 2024). In contrast to the findings of this study, research conducted at Curup Regional General Hospital reported a statistically significant association between maternal age and hypertensive disorders during pregnancy, with a p-value of 0.025 based on the chi-square test (Alvionita, Samidah, & Murwati, 2022). These findings reinforce the theory that age is a predisposing factor for the occurrence of hypertension in pregnancy.

Conversely, the control group showed the opposite distribution, with 8 pregnant women (20.0%) experiencing stress and 32 respondents (80.0%) classified as normal. Statistical analysis yielded an OR value of 16.000 with a 95% confidence interval (CI) of 5.349–47.858, indicating a significantly higher risk of hypertension in pregnant women experiencing stress compared to those with normal stress levels. This finding is statistically significant, as evidenced by a p-value of 0.000 ($p < 0.05$).

The differences between the results of this study and previous studies may be influenced by the number and characteristics of respondents. The majority of pregnant women, both in the case and control groups, were aged between 25 and 35 years, resulting in a relatively homogeneous age distribution and making the effect of age on the incidence of hypertension less statistically apparent. Differences in the location of the study and the multifactorial nature of pregnancy-induced hypertension may also have influenced the results, so that the effect of age was likely masked by other risk factors and was not found to be significantly associated with hypertension disorders of pregnancy.

The findings of this study indicate that maternal parity is not significantly associated with hypertension in pregnancy. Statistical tests yielded a p-value of 0.101 (>0.05), with an OR of 2.455 and a 95% confidence interval (CI) of (0.950–6.339). This indicates that pregnant women with at-risk parity (≥ 3) have a 2.455 times greater likelihood of developing hypertension compared to those with not at-risk parity (< 3); however, this association is not statistically significant.

Theoretically, pregnant women with high parity have a greater risk of developing hypertension during pregnancy (McCarthy & Maine, 1992). Repeated pregnancies and deliveries have the potential to cause changes in the uterus and vascular system, including decreased elasticity, which conceptually can contribute to increased blood pressure. This condition can make mothers who have experienced repeated childbirth more susceptible to pregnancy disorders, including hypertension, especially when

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accompanied by other risk factors (Shipa, Norfai, & Hadi, 2021).

While this study's findings differ from previous research, they remain consistent with theoretical perspectives on the impact of parity on hypertension in pregnant women. Putro Raseki Usalma et al. found that parity and hypertension were significantly related, with the association reaching statistical significance ($p = 0.003$, $p < 0.05$) (Usalma, Gani, & Hermatin, 2023). In addition, another study reported that most respondents had normal parity (81.7%), while only 18.3% had risky parity. Chi-square analysis showed a p-value of 0.020 ($p < 0.05$), indicating a significant relationship between parity and the incidence of hypertension in pregnant women (Naibaho, 2021).

The lack of a relationship between parity and hypertension during pregnancy may be influenced by respondent characteristics, as the majority of pregnant women in both the case and control groups had a parity of 1–2. Differences in the categorization of parity used in this study compared to several previous studies may also have influenced the grouping of respondents into risk categories, which ultimately affected the statistical analysis results. In addition, the possibility of other more dominant risk factors is thought to have contributed to the incidence of hypertension in pregnant women.

This study found that women who have had high blood pressure before are more likely to develop high blood pressure during pregnancy. The analysis showed that these women are six times more at risk compared to women who have never had high blood pressure. The statistical tests also confirmed that this relationship is strong and significant, based on the p-value and confidence interval.

The results of this study are consistent with the theory that a history of hypertension is one of the factors that play a role in increasing the risk of hypertension in pregnant women. The theory explains that the presence of chronic diseases in mothers, including hypertension, can affect the health status of mothers during pregnancy and increase the possibility of complications (McCarthy & Maine, 1992). Pregnant women with a history of hypertension, whether medically diagnosed or in previous pregnancies, are at higher risk of developing hypertension during pregnancy (Naibaho, 2021).

Similar to previous studies, this research shows that hypertension during pregnancy is more common

among women who have a prior history of hypertension. A study at the Padang Panjang Community Health Center in Kuala Pesisir District showed a significant relationship between a history of hypertension and the incidence of hypertension in pregnant women with a p-value of 0.000 and an OR of 262.857 (Marlina, Santoso, & Sirait, 2021). Evidence from a cross-sectional study in the Maccini Sawah Community Health Center area showed a statistically significant association ($p = 0.04$), supporting the findings of this study (Rahayu & Khotimah, 2024).

The relationship between a history of hypertension and the occurrence of hypertension in pregnant women can be explained by the mother's health condition prior to pregnancy. Physiological changes that occur during pregnancy may worsen blood pressure control in women with a prior history of hypertension, thereby increasing the need for closer monitoring. This highlights the importance of considering a history of hypertension in efforts to prevent hypertensive disorders during pregnancy.

Based on the analysis, nutritional status as measured by body mass index (BMI) was found to influence the occurrence of hypertension among pregnant women. The results showed an odds ratio (OR) of 2.914, indicating that pregnant women categorized as at risk were almost three times more likely to develop hypertension compared to those classified as not at risk. This finding was supported by a p-value of 0.040 ($p < 0.05$) and a 95% confidence interval ranging from 1.149 to 7.393.

Theoretically, the nutritional status of pregnant women as measured by Body Mass Index (BMI) is one of the factors that contribute to hypertension in pregnancy (McCarthy & Maine, 1992). A BMI that is outside the normal range, whether underweight or obese, indicates suboptimal nutritional status. A low BMI reflects limited energy and nutrient reserves, which can disrupt hemodynamic regulation and increase susceptibility to physiological stress during pregnancy (Indonesian Ministry of Health, 2021). Conversely, high BMI indicates nutritional problems due to excessive intake of calories, sugar, and salt, which are associated with increased fat tissue, blood volume, and metabolic and vascular disorders, thereby increasing the risk of hypertension in pregnancy (Mudlikah, Handajani, Nabila, Triastin,

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Widiyawati, & Nadhiroh, 2024; Indonesian Ministry of Health, 2021).

The results of this study are in line with research conducted at Sleman Regional General Hospital, which showed a significant relationship between nutritional status and the incidence of hypertension in pregnant women with a p-value of 0.003 ($p < 0.05$) (Magfuroh & Suyani, 2025). This finding is also supported by research in Bantul District, which shows a significant relationship between Body Mass Index (BMI) and the incidence of hypertension in pregnancy (p-value = 0.00; $RR = 1.45$) (Cahyaningtyas & Hakimi, 2022). In addition, other studies also reported a relationship between BMI and the incidence of hypertension in pregnancy with a p-value of 0.000 (Chouda & Wiyoko, 2021).

The findings of this study can be interpreted through physiological adaptations that occur during pregnancy. Excess body weight in pregnant women is associated with increased adipose tissue, which may impair endothelial function and reduce vascular elasticity, leading to higher vascular resistance and elevated blood pressure. These mechanisms highlight the importance of monitoring nutritional status during pregnancy as part of preventive efforts against hypertension.

The analysis demonstrated that stress level was strongly associated with the occurrence of hypertension in pregnant women. An odds ratio (OR) of 16,000 indicated that pregnant women experiencing high stress were 16,000 times more likely to develop hypertension compared with those with normal stress levels. This association was supported by a p-value < 0.05 and a 95% confidence interval of 5.349–47.858.

During pregnancy, stress experienced by pregnant women can increase susceptibility to various complications, one of which is hypertension in pregnancy (Sari, 2017). When pregnant women experience stress, the body responds through the activation of the sympathetic nervous system and endocrine system, which triggers a physiological response in the form of increased heart rate and narrowing of blood vessels, thereby increasing blood pressure (Jamaluddin, Sakinah, Helvian, Jalal, & Mahfudz, 2025).

Stress in pregnant women can be triggered by various factors, including anxiety and fear of childbirth, lack of sleep at night, unpreparedness for

parenthood, concerns about education or work, economic difficulties, and physical changes during pregnancy. Lack of sleep can increase sympathetic nerve activity at night, which affects heart rate and frequency, thereby contributing to increased blood pressure (Jayanti, Nasution, Nuraida, Fauzia, & Putri, 2022). Support for these findings can be found in a study carried out in the Pattallassang Community Health Center area of Takalar Regency, where stress level was identified as a factor associated with hypertension in pregnant women ($p < 0.05$) (Annisa, Nurdin, Tihardimanto, Rimayanti, & Ahmad, 2024).

The relationship between stress levels and the incidence of hypertension in pregnant women in this study can be explained based on the conditions found in the field. Most pregnant women in the case group experienced high stress levels, characterized by difficulty sleeping, anxiety related to previous pregnancies or first pregnancies, and emotional changes influenced by hormonal changes during pregnancy. The constant mental burden, accompanied by sleep disturbances, caused pregnant women to be in a state of prolonged stress, which had the potential to affect blood pressure stability. In contrast, pregnant women in the control group generally reported stress levels that were in the normal category, so they had better psychological adaptability to changes during pregnancy. The role of family is an important supporting factor in helping pregnant women manage stress, enabling them to feel calmer, more prepared to face pregnancy and childbirth, and able to maintain stable blood pressure during pregnancy.

CONCLUSION

This study, conducted in the working area of the Simpang IV Sipin Community Health Center, Jambi City, in 2025, identified several factors associated with hypertension among pregnant women. A history of hypertension, nutritional status based on body mass index (BMI), and stress level were found to be significantly related to the occurrence of hypertension, with p-values of 0.001, 0.040, and $p < 0.05$, respectively. In contrast, maternal age and parity were not shown to have a significant association with hypertension during pregnancy ($p = 0.138$ and $p = 0.101$).

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SUGGESTION

It is hoped that community health centers can increase promotive and preventive interventions, especially for pregnant women with high risk factors such as a history of hypertension, nutritional risk status, and high stress levels. Increased socialization, counseling, and routine monitoring during pregnancy can help reduce the incidence of hypertension and improve the quality of antenatal services. In addition, the community, especially the respondents in this study, namely pregnant women, should be able to prevent risk factors that can lead to hypertension during pregnancy. They are expected to pay more attention to their health, undergo regular check-ups, maintain a healthy diet, and manage stress during pregnancy. Public awareness of the risk factors for hypertension during pregnancy can improve early prevention, thereby minimizing complications.

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Factors Associated with Hypertension in Pregnant Women

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