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The association between stress and high-fat intake with hypertension among pregnant women in Bondowoso Regency

Hubungan stres dan konsumsi lemak tinggi dengan kejadian hipertensi pada ibu hamil di Kabupaten Bondowoso

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Abstract

Hypertension affects approximately 10% of pregnancies globally and remains a leading cause of maternal mortality and morbidity. Mothers with hypertension in their first pregnancy are at an elevated risk for preeclampsia in subsequent pregnancies. This study aimed to analyze the relationship between stress and high-fat intake and the incidence of hypertension in pregnant women. This was an observational study that used a cross-sectional approach from May to June 2024. The study population included pregnant women who were patients of the Maesan Health Center and residing in Bondowoso Regency. The sample selection used Slovin's formula: 73 out of 263 pregnant women. Stress variables were measured using the Revised Prenatal Distress Questionnaire (NuPDQ), a 2 × 24-hour recall questionnaire for fat intake measurements, and blood pressure measurements using a tensimeter. Univariate analysis described each variable, including respondents' stress status and high-fat dietary intake. Moreover, bivariate analysis used chi-square tests to assess the relationship between the independent variables (stress and fat intake) and the dependent variable (hypertension). This study found that there was an association between stress and high-fat intake and the incidence of hypertension, with p-values <0,001 and <0,001, respectively. We recommend addressing both stress management and dietary habits as crucial in prenatal care programs.

Keywords: Hypertension, pregnancy, stress, fat dietary intake

Abstrak

Hipertensi pada kehamilan merupakan penyebab angka kematian tertinggi. Ibu yang mengalami hipertensi pada kehamilan pertama akan meningkatkan risiko terjadinya preeklampsia pada kehamilan berikutnya. Penelitian ini bertujuan untuk menganalisis hubungan stres dan asupan lemak tinggi dengan kejadian hipertensi pada ibu hamil. Penelitian ini merupakan penelitian observasional dengan pendekatan cross-sectional pada bulan Mei sampai dengan Juni 2024. Populasinya adalah ibu hamil pasien Puskesmas Maesan yang berdomisili di Kabupaten Bondowoso. Pemilihan sampel menggunakan rumus Slovin; 73 responden dari 263 ibu hamil. Pengukuran variabel stres menggunakan kuesioner Revised Prenatal Distress Quissionaire (NuPDQ), kuesioner recall 1×24 jam untuk pengukuran asupan lemak, dan pengukuran tekanan darah menggunakan tensimeter. Analisis univariat menggambarkan setiap variabel, termasuk status stres responden dan asupan makanan berlemak tinggi. Selain itu, analisis bivariat menggunakan uji Chi-square untuk menilai hubungan antara variabel independen (stres dan asupan lemak) dan variabel dependen (hipertensi). Hasil penelitian ini menunjukkan bahwa terdapat hubungan antara stres dan asupan lemak tinggi dengan kejadian hipertensi dengan nilai p-value masing-masing <0,000 dan <0,000. Kami merekomendasikan bahwa penanganan stres dan kebiasaan makan sangatlah penting dalam program perawatan prenatal.

Kata Kunci: Hipertensi, kehamilan, stres, asupan lemak

Introduction

Hypertension is a significant public health concern, particularly among pregnant women, as it can lead to severe complications in both mothers and their infants. It is characterized by elevated blood pressure, defined as systolic blood pressure (SBP) ≥ 140 mm Hg and diastolic blood pressure (DBP) ≥ 90 mm Hg. Hypertension during pregnancy can manifest as gestational hypertension, preeclampsia, or eclampsia, all of which carry increasing risks for maternal morbidity and mortality. According to the World Health Organization (WHO), approximately 1,13 billion people globally suffer from hypertension, representing about one in three adults (World Health Organization, 2025). This condition has been on the rise, with significant implications for health systems worldwide (Marlina et al., 2021). In Indonesia, the Indonesia Health Survey (SKI) 2023 reported a hypertension prevalence of 22,2% (Ministry of Health of Indonesia, 2024). Notably, hypertension in pregnancy is a leading cause of maternal mortality, contributing to increasing Maternal Mortality Rates (MMR), which serve as critical indicators of health care quality and societal well-being.

Maternal Mortality Rates reflect the health status of a population and can indicate the effectiveness of health care systems. Factors influencing MMR include complications during pregnancy, childbirth practices, and postpartum care (World Health Organization, 2025). In a preliminary study in East Java, the Bondowoso Regency was identified as one of the regions with the highest MMR. In 2020, 19 maternal deaths were reported, a number that surged to 43 in 2021, before decreasing to 17 in 2022. The primary cause of maternal death has been linked to hypertension during pregnancy.

In Bondowoso Regency, particularly in Maesan Sub-District, data from Maesan Health Center, Bondowoso, hypertension is the third highest disease (Suharta & Anggrianti, 2021). In 2020, the Maesan Health Center recorded 12,215 cases of hypertension, which increased to 12,458 cases in 2021. Furthermore, there were approximately 4,089 pregnant women in the Maesan Sub-District as of 2023 (Badan Pusat Statistik, 2023). This demographic context underscores the urgency of addressing hypertension among pregnant women in this area.

Stress is a significant contributor to various health issues, including hypertension. Research indicates that stress can account for approximately 50-70% of the causes behind metabolic and hormonal diseases such as hypertension, cardiovascular diseases, and others (Gunawan & Adriani, 2020). During pregnancy, women may experience heightened stress levels due to the physical changes and psychological adjustments required by this life stage. Stress can trigger physiological responses that lead to increased blood pressure through mechanisms such as the release of adrenaline, which causes vasoconstriction and elevated heart rate (Obeagu et al., 2024).

Moreover, stress is often linked to emotional eating behaviors, which may lead to poor dietary choices. Studies have shown that higher stress levels correlate with an increased consumption of high-fat and high-sugar foods. For instance, Fitri et al. (2022) found that as stress levels rise, carbohydrate intake tends to decrease, while fat intake increases. Diets rich in saturated fats and trans fats can adversely affect cholesterol levels—specifically low-density lipoprotein (LDL) cholesterol—leading to plaque formation in blood vessels and contributing to hypertension (Fitri et al., 2022). Unhealthy eating habits during pregnancy are often exacerbated by cravings and an increased appetite associated with hormonal changes. A study by Mitran (2024) highlighted that many pregnant women tend to indulge in high-fat foods despite being aware of their potential health risks. This dietary pattern raises concerns about the combined effects of stress and high-fat diets on maternal health outcomes (Mitran et al., 2024).

However, few studies in Indonesia have explored the combined effects of stress and dietary fat on hypertension during pregnancy. It is crucial to investigate how stress and high-fat dietary patterns influence hypertension in pregnant mothers in the Maesan Sub-District. A previous study highlighted that pregnant women experiencing psychological stress are nearly 5,79 times more likely to develop PIH compared to those who are not stressed (Abera, 2018). Another study stated that pregnant women may resort to unhealthy eating patterns, including high-fat diets, as a coping mechanism for stress, which can lead to weight gain and further increase hypertension risk (Iffah et al., 2023). Understanding these relationships can

provide valuable insights into effective preventive strategies aimed at reducing the risk of hypertension during pregnancy. By addressing both psychological and dietary factors, healthcare providers can develop comprehensive interventions that promote better maternal health outcomes and ultimately reduce the maternal mortality rates associated with hypertensive disorders during pregnancy.

This study aimed to analyze the association between stress and high-fat intake and the incidence of hypertension among pregnant mothers in the Maesan Sub-District. By exploring these interconnected factors, we hope to contribute to the body of knowledge necessary to improve maternal health strategies in regions facing similar challenges.

Methods

This was an observational, cross-sectional study. The study population included pregnant women who were patients of the Maesan Health Center and residing in Bondowoso Regency. This study was conducted between May and June 2024.

The sample selection used Slovin's formula:

$n=N/(N.d^2+1)$,

$n=(263/(263*0,1^2+1)$

$n=73$.

73 respondents were selected from a total of 263 pregnant women. The exclusion criteria included respondents with complications from diseases other than hypertension, and those who could not communicate effectively.

The data were collected through structured interviews and questionnaires. Stress levels are assessed using the Revised Prenatal Distress Questionnaire (NuPDQ), which evaluates concerns experienced during pregnancy (Lobel et al., 2008). The stress category was determined based on normality tests, using median values as a cutoff: stress was defined as > median value, while ≤ median value indicated no stress. Dietary Fat Intake Assessment was measured using a 2×24-hour dietary recall questionnaire, which captures detailed information about food consumption over two non-consecutive days. The survey was conducted on weekdays and weekends (Tuesday and Saturday/Sunday). Fat intake categories will include Low (<80% of Recommended Dietary Allowance), Adequate (80-110% of Recommended Dietary Allowance), and Excessive (>110% of Recommended Dietary Allowance) based on WNPG guidelines (Lembaga Ilmu Pengetahuan Indonesia, 2018). Blood pressure was measured three times using a digital tensimeter (Omron Brand) to determine whether the respondent had hypertension. Hypertension will be categorized as blood pressure ≥140/90 mmHg (World Health Organization, 2025). Additional demographic information, such as age and gestational age, was collected.

Univariate analysis described each variable, including respondents' stress status and high-fat dietary intake. Moreover, bivariate analysis used chi-square tests to assess the relationship between the independent variables (stress and fat intake) and the dependent variable (hypertension). A p-value < 0,05. indicate a statistically significant relationship, while a p-value > 0,05. suggest no significant relationship. In addition to univariate and bivariate analyses, potential confounding variablessuch as age, parity, socioeconomic status, and other relevant factorswill be identified based on the literature and subject-matter knowledge. In this study, validity and reliability tests were obtained from a previous study. The validity test of the NuPDQ (Revised Prenatal Distress Questionnaire) used the Pearson product moment test method with a value range of -0,53-0,583. The reliability analysis of the NuPDQ (Revised Prenatal Distress Questionnaire) used Cronbach's alpha calculation with a significance value of 0.736. The questionnaire can be reliable if the Cronbach's alpha value > 0,60 (Santoso, 2018).

The Health Research Ethics Committee at the Faculty of Public Health, University of Jember conducted an ethical review of this study. This approval ensured that the study adhered to ethical standards concerning participant rights and welfare (certification number No. 534/KEPK/FKM-UNEJ/VI/2024).

Result and Discussion

Description of Respondent Characteristics, Stress, Fat Intake, and Incidence of Hypertension

The respondent characteristics consisted of age, gestational age, parity, stress status, and fat intake. The results of the field interviews regarding respondents' characteristics are shown in Table 1.

Table 1. Description of respondent characteristics, stress, fat intake, and incidence of hypertension in the Maesan Health Center Area

Variable	n	%
Age (years old)		
High Risk (<20 & >35)	14	19,2
Low risk (20-35)	59	80,8
Gestational age (weeks)		
Trimester I (1-13)	12	16,4
Trimester II (14-26)	27	37
Trimester III (27-40)	34	46,6
Parity		
1st	34	46,6
2nd	27	37
3rd	12	16,4
Stress Status		
Yes	36	49,3
No	37	50,7
Fat intake		
Low	15	21
Moderate	25	34
High	33	45
Hypertension		
Yes	41	56,2
No	32	43,8

The investigation into the dual impact of stress and high-fat diets on hypertension among pregnant mothers revealed critical insights from univariate analysis (Table 1). A significant finding is that most respondents (80,8%) were within the low-risk age category of 20-35 years, which is generally considered optimal for pregnancy due to the maturity of the reproductive system (Nurhasanah et al, 2023) (Chang et al., 2023; Naibaho, 2021). This age range is essential for assessing nutritional needs, as it aligns with the dietary guidelines established in 2019, emphasizing the importance of adequate nutrient intake during pregnancy (Naibaho, 2021).

The analysis further indicated that 46,6% of the respondents were in their third trimester, a period often associated with increased anxiety and stress due to anticipation of childbirth. This heightened anxiety can stem from various factors, including fears about labor and the responsibilities of motherhood, which can contribute to elevated stress levels during pregnancy (Naibaho, 2021). Research has shown that stress during pregnancy can lead to adverse health outcomes, including hypertension, which poses risks for both the mother and the fetus (Obeagu et al., 2024).

Moreover, the study highlighted that a significant proportion of respondents were primigravida or first-time mothers, who typically experience higher anxiety levels compared to those with previous pregnancies. This finding aligns with the existing literature that indicates that first-time mothers often report moderate to severe anxiety, which can exacerbate stress-related health issues, including hypertension. In contrast, women with prior pregnancies tend to experience lower anxiety levels, suggesting that experience may mitigate some of the stress associated with pregnancy (Fauziyah & Anggraeni, 2023).

Unexpectedly, the results showed that 50,7% of the respondents did not experience stress, likely due to supportive family environments and social networks that provide emotional and practical assistance during pregnancy. This finding is consistent with those of studies that emphasize the role of social support in reducing stress and enhancing overall well-being among pregnant women. The presence of a supportive network can significantly alleviate the physical and emotional stressors that pregnant women face, thereby potentially reducing the incidence of hypertension (Al-Mutawtah et al., 2023).

Regarding dietary habits, the study found that 45% of the respondents had a high intake of fats, primarily from fried foods, which is concerning, given the established link between high-fat diets and increased blood pressure. Based on a 24-hour recall method, the analysis of dietary intake indicated that many pregnant women favored high-fat and high-sugar foods, which can lead to excessive caloric intake and contribute to obesity and hypertension. This dietary pattern is particularly alarming as hypertension during pregnancy poses significant risks, including complications such as preeclampsia and adverse fetal outcomes (Omertayeva et al., 2020).

The prevalence of hypertension among the respondents was notably high, with 56,2% being diagnosed with elevated blood pressure levels. Hypertension in pregnant women is associated with severe health risks, including cardiovascular complications and adverse fetal outcomes, such as intrauterine growth restriction and preterm birth. The findings underscore the need for targeted interventions that address both dietary habits and stress management to improve health outcomes for pregnant women and their infants (Cífková, 2023; Omertayeva et al., 2020; Stephansson & Sandström, 2024).

The Relationship between Stress Level and High-Fat Diets with The Incidence of Hypertension

Bivariate analysis revealed significant relationships between stress levels, high-fat intake, and incidence of hypertension among pregnant women (p <0,001). These findings indicated that both stress and dietary habits play crucial roles in the development of hypertension during pregnancy (Table 2). Especially, most respondents experiencing stress were first-time mothers, or primigravida, who reported heightened anxiety regarding childbirth and infant care (O'Donnell et al., 2023; Palomo-Gómez et al., 2024). This aligns with existing literature, which suggests that first-time mothers often face unique stressors, including concerns about the health and well-being of their newborns, financial implications, and the birthing process itself (Iino et al., 2023).

Table 2. The relationship between stress level and high-fat diets with the incidence of hypertension in the Maesan Health Center Area

Variable	Hypertension				Total		p-value
	Yes		No				
	n	%	n	%	n	%	
Stress Status							
Yes	31	75,6	5	15,6	36	49,3	<0,001*
No	10	24,4	27	84,4	37	50,7	
Fat dietary intake							
Low	0	0	15	47	15	21	
Moderate	12	29	13	41	25	34	<0,001*
High	29	71	4	12	33	45	

*p-value< α (0,05) (chi square test)

Many respondents expressed concern about the effects of environmental factors, such as exposure to secondhand smoke due to the smoking habits of their partners, and worry about the effects of medications during pregnancy. This exposure to harmful substances can exacerbate stress and contribute to adverse health outcomes, including hypertension (Ristiani et al., 2024; Damen et al., 2021; Draganović et al., 2016; Miliku et al., 2016; Paknahad et al., 2019).Click or tap to enter text. The physiological mechanisms underlying the relationship between stress and hypertension are well-documented. Stress activates the hypothalamic-pituitary-adrenal (HPA) axis, releasing stress hormones such as cortisol and adrenaline (Herhaus et al., 2020; Walther & Wirtz, 2023). Elevated cortisol levels can impair immune function and increase susceptibility to various health issues including hypertension (Buffa et al., 2018). Furthermore, adrenaline can cause increased heart rate and blood pressure through sympathetic nervous system activation, leading to vasoconstriction and elevated vascular resistance (Preis et al., 2020). Thus, psychological stress experienced by pregnant women can have profound physiological implications, contributing to the risk of developing hypertension.

In addition to stress, bivariate analysis also demonstrated a significant relationship between high-fat diet intake and the incidence of hypertension among pregnant women (p <0,001). This finding indicates that dietary habits, particularly the consumption of high-fat food, play a critical role in the development of hypertension during pregnancy. The results are consistent with previous research identifying a direct correlation between dietary fat intake and blood pressure levels (Güner & Öztürk, 2022).

The study found that many respondents consumed excessive amounts of visible fats, such as oils and butter, which are linked to an increased risk of hypertension and other cardiovascular diseases. Previous studies reported that pregnant women who consumed high levels of visible fats had a higher prevalence of preeclampsia and chronic hypertension (Himes & Simhan, 2010; Sackey et al., 2018; Singh et al., 2021; Watanabe et al., 2013). The dietary habits of the respondents reflected a broader trend within the Indonesian population, where high-fat and oily foods are commonly consumed (Anyanwu et al., 2022; Oddo et al., 2019). Excessive fat intake, particularly saturated fats, can lead to atherosclerosis and vascular resistance, ultimately resulting in elevated blood pressure (Palomo-Gómez et al.,

2024). The physiological consequences of a high-fat diet include increased cholesterol levels and arterial plaque formation, which can impair blood flow and contribute to hypertension. The findings of this study highlight the importance of dietary management during pregnancy as excessive fat consumption can exacerbate the risk of hypertension and associated complications. The implications of these dietary habits are profound, as they not only affect maternal health but may also predispose offspring to obesity and cardiovascular diseases later in life (Crume et al., 2016; Wang et al., 2018).

This study has several limitations. First, the cross-sectional design precludes the establishment of causality between stress, high-fat diet, and hypertension. Second, dietary intake was assessed using a 24-hour recall method, which may be subject to recall bias and may not reflect long-term dietary habits. Third, the sample was drawn from a single health center in the Bondowoso Regency, which may limit the generalizability of the findings to other populations.

The study's findings have several important implications for clinical practice and public health interventions. Midwives and health centers should implement routine screening for stress and assess dietary habits during prenatal visits, particularly among primigravida women (first-time pregnancy). Nutritional counseling should emphasize reducing high-fat and oily foods and promoting a balanced diet rich in fruits, vegetables, and lean proteins. Strategies to reduce stress, such as support groups, should be integrated into antenatal care programs. These interventions can mitigate stress, reduce high-fat intake, substantially lower the risk of hypertension during pregnancy, and improve maternal and infant health outcomes. Further research should explore the effectiveness of these interventions in reducing the incidence of hypertension and improving maternal and fetal outcomes in similar populations.

Conclusion

There is a significant relationship between stress levels and the incidence of hypertension, and between high-fat dietary intake and the incidence of hypertension among pregnant women in the Maesan Health Center area. These factors can exacerbate the risk of hypertension and its associated complications. We recommend that prenatal care programs incorporate routine stress screening and nutritional counseling tailored to reducing high-fat dietary patterns. Further research using prospective designs is needed to confirm causality.

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