

Obesity and Hypertension in Pregnant Women and Its Impact on Fetal Welfare

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KEYWORDS

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ABSTRACT:

Introduction: The incidence of obesity in all pregnancies is approximately 21.3%. In Indonesia, the prevalence of obesity increased by 15.4% by the end of 2019.

Objectives: This study aims to analyze the relationship between obesity and pregnancy-induced hypertension (PIH) on fetal welfare.

Methods: The design of this study was a prospective cohort study. The inclusion criteria were pregnant women in the second trimester who were obese and hypertensive. The sample used was 30 respondents. The place and time of data collection were at the hospital, from March to April 2023. The instruments used included observation sheets for obesity status, hypertension, fetal heart rate (FHR), and fetal movement. Data were analyzed using the Kruskal-Wallis statistical test.

Results: The results of the study showed that obesity and hypertension in pregnant women have an impact on fetal well-being. Where the average DJJ in obese and hypertensive pregnant women is 149 times per minute and there is a significant relationship (p-value <.05). Pregnant women with obesity or hypertension have an average DJJ of 144 and 142 times per minute respectively, there is a significant relationship (p-value <.05). Fetal movement in obese and hypertensive pregnant women is 3 times movement/hour. While pregnant women with hypertension or obesity have an average fetal movement of 4 times movement/hour there is no significant relationship (p value > .05).

Conclusions: Obesity status and PIH are associated with fetal welfare. Pregnant women should undergo obesity and PIH screening before and after planning a pregnancy to prevent unwanted complications.

1. Introduction

The high incidence of obesity and hypertension has led to an increase in neonatal mortality among mothers with hypertension during pregnancy, which is approximately 10–16% higher compared to healthy mothers (Valadbeigi et al., 2019) According to the Centers for Disease Control and Prevention, the global infant mortality rate in 2017–2018 was approximately 61%, with maternal overweight (25.0%) and obesity (35.7%) during pregnancy contributing significantly to these cases. (Bicocca et al., 2020) also reported that mothers with obesity experience a higher incidence of neonatal mortality per thousand births compared to women of normal weight. Additionally, (Ren et al., 2023) stated that obesity, which results from excessive fat accumulation, can disrupt metabolism and affect fetal heart rate.

Previous studies have shown that obesity in pregnant women is associated with increased heart rate, decreased heart rate variability, and reduced left ventricular volume in newborns. If these physiological changes persist, they can increase the risk of cardiovascular disorders in adulthood (Groves et al., 2022). Obesity has also been identified as a risk factor for preterm birth (Santos et al., 2019).

Another consequence of obesity during pregnancy is a 40% increase in blood volume and cardiac output compared to pre-pregnancy levels. This increase is explained by the greater fat volume and

tissue mass, which require enhanced respiratory activity—up to three times more frequent than in women with normal weight (Loverro et al., 2022)

Regarding hypertension during pregnancy, maternal deaths due to this condition in Indonesia have been recorded in approximately 1,110 cases (Kemenkes, 2020). The high incidence of hypertension has also contributed to increased neonatal mortality, with rates around 10–16% higher among hypertensive mothers compared to healthy mothers (Valadbeigi et al., 2019).

Studies have demonstrated that hypertension during pregnancy negatively impacts the fetus by causing maladaptation of the spiral arteries in the uterus and placenta, leading to inadequate adaptive vasodilation. This condition increases peripheral vascular resistance, resulting in placental-fetal hypoxia and affecting fetal heart rate (Phillips et al., 2020). In hypertensive pregnancies, fetal hypoxia occurs due to reduced oxygen and nutrient supply to the fetal brain, which can impair lung ventilation and increase the risk of infant mortality (Berhe et al., 2019).

Additionally, hypertension during pregnancy can lead to fetal growth restriction, distress, and intrauterine fetal demise (James et al., 2017). Obesity and hypertension during pregnancy significantly impact both maternal and fetal outcomes. Therefore, early detection of fetal heart rate and movements, along with appropriate intervention strategies, are essential to ensure maternal and fetal well-being (James et al., 2017; Phillips et al., 2020).

A normal fetal heart rate (FHR) ranges between 120–160 beats per minute (bpm). If the FHR falls below 120 bpm, it is classified as bradycardia, whereas an FHR exceeding 160 bpm is categorized as tachycardia (Abdelal et al., 2022).

Fetal well-being can also be assessed by manually counting fetal movements using methods such as the Sadowsky or Cardiff technique (Bekiou & Gourounti, 2020). Another approach is the Non-Stress Test (NST), which monitors fetal heart rate in response to spontaneous or stimulated fetal movements using a monitor available in healthcare facilities (NN, 2022).

2. Objectives

The present study differs from previous research by focusing on obese and hypertensive pregnant women in the second trimester and assessing changes in fetal heart rate and movement. Based on this information, the study aims to analyzing the relationship between obesity and hypertension during pregnancy on fetal welfare. The findings are expected to provide valuable information to pregnant women, enabling them to screen for obesity and hypertensive disorders before conception, thereby preventing complications during pregnancy.

3. Methods

This study used a prospective cohort design. The study has two variables. The dependent variable is fetal heart rate, while the independent variables are obesity and hypertension during pregnancy. The study population was pregnant women in the second trimester who were diagnosed with obesity and hypertension. The number of samples was determined using the two-proportion hypothesis test formula. The results of the calculation of the number of samples were 30 respondents. The samples included in the study met the inclusion and exclusion criteria. The sampling technique was purposive sampling.

The location of the study was a hospital in DKI Jakarta. The time of data collection was between March and April 2023. Data collection used instruments, including demographic data, weight status observation sheets, height to calculate Body Mass Index (BMI), blood pressure measurements, and fetal movement assessments. Statistical analysis was carried out using the Kruskal-Wallis test.

This study has obtained ethical approval with certificate number No. 224/KEPK-IJK/III/2023.

4. Results

Based on the results of data collection that has been processed and analyzed, the following research results are obtained:

Table 1. Characteristics of Obese and Hypertension Pregnant Women in the Hospital (n = 30)

No	Variabel	Mean	SD	Min-Max
1	Mother's age	32,60	5,79	21-45
2	Pregnancy age	23,23	2,38	18-26
3	Blood Pressure Systole	134	15,6	93-175
4	Blood Pressure Diastole	80	16,2	50-143
5	Body Weight	70	12,1	45-93
6	Height	158	5,62	148-170

Source: Authors

Table 1. illustrates the age range of obese and hypertensive pregnant women (21–45 years) with an average age of 33 years. Gestational age between 18 - 26 with an average gestational age of 23 weeks. Systolic blood pressure status is between 93 -175mmhg with an average of 134 mmHg. Diastole blood pressure status ranges between 50 -143 mmHg with an average of 80 mmHg.

Based on the weight range of pregnant women, 45-93 kg with an average of 70 kg Maternal height range is 148–170 cm with an average of 160 cm. The foetal heart rate range is 137-161x/minute with an average of 145x/minute, and the range of foetal movements is 3-4x/hour with an average of 4x movements in one hour.

Table 2. Fetal characteristics (n = 30)

Variables	Mean	SD	Min	Max
Heart Rate Fetus	145,30	5,553	137	161
Fetal Movements	4x movement	0,245	3	4

Source: Authors

Table 2. describes the fetal heart rate range, which is 137-161 x/min with an average of 145 x/min. Based on the range of fetal movement, which is 3-4x movements/hour with an average of 4x movements/hour.

Table 3. Relationship of obesity and hypertension during pregnancy with fetal heart rate (n = 30)

Health Status of Pregnant omen	N	Mean FHR	Mean Rank	P Value
1 Obesity and HDK	10	149.00	20.75	.029
2 Obesity	10	144.60	15.45	
3 Hypertension	10	142.30	10.30	
Total	30			

Source: Authors

Table 3. The results of the Kruskal-Wallis statistical test of the relationship between obesity and hypertension in pregnancy on fetal heart rate (FHR) showed a difference in fetal heart rate in obese and hypertensive mothers. The average FHR of obese pregnant women was 144x/minute, and hypertensive pregnant women had an average FHR of 142x/minute. Based on the results of the analysis

of the relationship between obesity and hypertension in the second trimester of pregnancy on fetal heart rate, there was a significant relationship (p -value $<.05$).

Table 4. Association of obesity and hypertension in pregnancy with fetal movement (n = 30)

Health Status of Pregnant Women	N	Mean Gerak Janin	Mean Rank	P Value
1 Obesity and HDK	10	3.80	13.50	
2 Obesity	10	4.00	16.50	.126
3 Hypertension	10	4.00	16.50	
Total	30			

Source: Authors

Table 4. illustrates the results using the Kruskal-Wallis statistical test. There is a picture of fetal movement from obese and hypertensive mothers with an average FHR of obese pregnant women of 3x movements/hour and hypertensive or obese pregnant women with an average fetal movement of 4x movements/hour. With a p -value of 0.126. Based on the results of the analysis of the relationship between obesity and hypertension in the second trimester of pregnancy on fetal movement, it was found that there was no significant relationship (p -value $>.05$).

5. Discussion

Based on current research, the average age of mothers with obesity is older. Obesity during pregnancy can usually occur in women of any age, but the weight will generally increase more in mothers aged ≥ 35 . Normally, weight gain during pregnancy is around 12–16 kg; if the weight gain is more than the specified number, the woman is obese (Leddy et al., 2008).

The results of BMI measurements in pregnant women based on calculations of weight and height show that BMI is higher than the average normal BMI value in pregnant women. This study shows that these pregnant women are included in the obese category. The incidence of obesity and hypertension in mothers during pregnancy has a higher percentage compared to pregnant women with normal conditions (Bohiltea et al., 2020a). So that the blood vessels experience blood pressure resistance and an increase in left ventricular mass followed by greater changes in cardiac output (Patel et al., 2024). The impact of these conditions affects maternal circulation to the fetus. These changes result in disturbed maternal and fetal conditions. This is indicated by the picture of the fetal heart rate in obese pregnant women having a higher frequency than in non-obese pregnant women (Paredes et al., 2021). So it can be stated that maternal-fetal oxygenation circulation provides impaired fetal welfare output. This is evidenced by research on changes in DJJ and fetal movement in the mother and fetus during pregnancy.

Likewise, according to Ely et al. (2020), the infant mortality rate in pregnant women with obesity accompanied by age ≥ 30 years is higher than in pregnant women without obesity and age ≤ 30 years. so that pregnant women with obesity and age can be one of the factors that affect the continuation of pregnancy.

The results of the current study on obese pregnant women with hypertension at 23 weeks of gestation. This study illustrates that fetal heart rate variability (FHR) does not show any decrease. Previous studies have shown that obese pregnant women at 36 weeks of gestation more often show decreased DJJ variability and fewer accelerations (Sylwestrzak et al., 2021). The current pregnancy condition showed that the average DJJ appeared normal and did not show a decrease in DJJ variability. Previous studies have shown that obese pregnant women at 36 weeks of gestation more often show decreased DJJ variability and fewer accelerations. This condition can be influenced by factors such as the presentation that the fetus has entered the pelvic cavity and oxygenation circulation to the uterine blood vessels is inhibited. So that the oxygen needs of the fetus decrease.

This study shows that the blood pressure of pregnant women exceeds the normal limit. Blood pressure can be stated as being at risk if systolic blood pressure is above 140 mmHg and diastolic blood pressure is above 90 mmHg, which is stated in the category of grade I hypertension (Reddy et al., 2020). Based on the information above, the average systolic blood pressure condition is 134 mmHg, which is included in the category of prehypertension. The picture of hypertension in pregnant women can affect the fetal heart rate (Martaadisoebrata et al., 2013).

In addition, hypertension in pregnant women can stimulate fetal distress. Clinically, this is believed to be one of the main causes of fetal hypoxia during pregnancy. Hypertension in pregnancy, if it continues and worsens, causes the volume of red blood cells and blood viscosity to increase. These changes will further worsen the degree of blood vessel blockage, so that oxygen circulation to the uterus decreases and causes the fetus to experience hypoxia. The fetus cannot breathe normally, so the fetal heart rate will increase and become irregular, as well as the fetal motor system being disrupted (Liu et al., 2023).

This study shows that hypertension in pregnant women can trigger premature birth, and the life of the baby being born is threatened. Babies who are not old enough to be born have a poor prognosis for further growth (Sutan et al., 2022). Based on the description of the characteristics of fetal well-being, the fetal heart rate can be known. The fetal heart rate in this study was on average normal, namely 145 x / minute. It is said to be good if the fetal heart rate is in the range of 120-160 x/min, according to (Martaadisoebrata et al., 2013).

The fetal movements in this study were on average normal (active), that is, 4 movements/hour. It is said to be good if the mother feels 4 fetal movements in one hour (Sardovsky method) (Bekiou & Gourounti, 2020).

Based on obesity and hypertension, there is a significant relationship to fetal heart rate. Obesity and hypertension have a significant relationship to fetal well-being; as stated by previous researchers, obesity and hypertension can affect fetal heart rate. Overweight conditions that occur in pregnant women create a thickening of fat that can interfere with the circulation of nutrients and oxygen to the fetus through the placenta. This situation triggers the fetal heart rate to become abnormal (Bohiletea et al., 2020b). Hypertension can also affect fetal heart rate due to maladaptation of the spiral arteries in the uterus and placenta, causing failure of normal adaptive vasodilation (Jain & Acharya, 2022; Phillips et al., 2020).

Vascular maladaptation results in peripheral vascular resistance, thus increasing placental-fetal hypoxia and affecting fetal heart rate (Phillips et al., 2020). Mothers pregnant who are obese and hypertensive are more at risk of complications of maternal and fetal well-being because pregnant women with obesity are likely to experience decreased fetal movement more often than pregnant women with a normal BMI (Huecker et al., 2023). In this study, there was a decrease in fetal movement in two mothers who experienced obesity and pregnant-induced hypertension (PIH).

6. CONCLUSION

The results of the study that have been presented show that obesity and hypertension in pregnancy can have an impact on fetal well-being. There are differences in DJJ in obese and hypertensive pregnant women. Where DJJ experiences a higher frequency in obese and hypertensive pregnant women compared to pregnant women who are only obese or hypertensive. The description of DJJ and fetal movement is one of the variables that can indicate that the fetus is in poor condition. While hypertension in pregnancy can trigger premature labor. Therefore, obesity and hypertension in pregnancy are factors that need to be prevented from pregnancy so that the fetus can remain healthy until birth at a mature gestational age.

The limitations of the study include data collection that has not reached several areas with different tribes and cultures. So it is hoped that we can see the description of obesity and hypertension in pregnancy on fetal well-being from the perspective of the patient's culture. The scope of further research in the future is to expand the scope of data collection from various tribes and cultures. In addition, studying the behavior of each tribe and culture of pregnant women that trigger obesity and

hypertension. It is hoped that the problem of obesity and hypertension during pregnancy can be prevented, and the output is that the fetus and mother are increasingly prosperous.

Recommendations for practitioners need to screen for obesity and hypertension in mothers when starting a pregnancy program. Practitioners can also identify triggers for obesity and hypertension in pregnant women based on ethnicity and culture. This effort can be a form of contribution to the government's program to improve maternal and child health. So that the incidence of maternal and child mortality and morbidity during pregnancy can decrease.

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