

Relationship of Cholesterol Levels with Gestational Hypertension and Preeclampsia During Pregnancy

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ABSTRACT

Hypertension is an important risk factor for cardiovascular disease, coronary heart disease, peripheral vascular disease, stroke and kidney disease. To avoid these complications, efforts are made to control blood pressure within normal limits both pharmacologically and non-pharmacologically. The cardio-cerebrovascular disease is one of the main causes of morbidity and mortality, with a mortality rate of 17 million worldwide each year or 31% of all mortality. The five biggest causes of maternal death in Indonesia include hypertension in pregnancy. It is suspected that one of the causes of gestational hypertension is obstruction of blood flow by cholesterol. In the case of hypertension during pregnancy, this is one of the risks of developing preeclampsia. Preeclampsia is a danger sign that often occurs in pregnant women, which increases maternal mortality and morbidity. The aim of this study was to determine the relationship between cholesterol levels and events pregnancy-induced hypertension during pregnancy. This study is an observational study designed as a cross-sectional study. The sample size is 30 respondents, selected through continuous sampling. Then the results of the examination will be carried out by using the chi-square test. The results of the study stated that there was a significant relationship between cholesterol levels and events of gestational hypertension during pregnancy with a p-value of 0.024 and can be concluded that the higher the cholesterol during pregnancy, the higher the risk of experiencing gestational hypertension. There is no relationship between cholesterol during pregnancy with incidence preeclampsia in preterm ($p = 0,062$; $p > 0,05$).

Keywords: *Pregnancy, Cholesterol, Gestational Hypertension, Preeclampsia*

1. INTRODUCTION

Currently, hypertension is still a major health problem in the world with an incidence of more than one billion people. Based on the data recapitulation of the World Health Organization (WHO) in 2013, it is known that around one billion people in the world suffer from hypertension and it is predicted that in the following years the incident will increase. Hypertension prevalence increased in African countries by 46% and lower in developed countries by 35%. In the United States the prevalence of hypertension is 31%, males are higher than females (39% and 23%). The incidence of hypertension increases by 10% at the age of 30 years and increases by 30% at the age of 60 years.[1]

Hypertension in pregnancy is a non-communicable disease that causes maternal death. Non-communicable disease (PTM) is a chronic disease that is not transmitted from person to person. NCDs include hypertension, diabetes, heart

disease, stroke, cancer, and chronic obstructive pulmonary disease (COPD). PTM is the cause of death for nearly 70% of the world. Based on the results of the Basic Health Research (Riskesmas) in 2007 and 2013, it appears that there is an increasing trend in the prevalence of PTM such as hypertension, diabetes, stroke, and joint disease/rheumatism/gout. This phenomenon is predicted to continue.[2]

Hypertension in pregnancy is common and is the leading cause of maternal death and has other serious effects during childbirth. Hypertension in pregnancy occurs in 5% of all pregnancies. In the United States, the incidence of pregnancy with hypertension is 6-10%, where there are 4 million pregnant women and an estimated 240,000 are accompanied by hypertension each year. Hypertension is a risk factor for stroke, and its incidence is increasing during pregnancy. 15% of maternal deaths in the United States are caused by intracerebral hemorrhage.[3], [4]

Pregnancy-induced hypertension has a greater risk of premature labour, IUGR (intrauterine growth retardation), morbidity and mortality, acute renal failure, acute liver failure, bleeding during and after delivery, HELLP (haemolysis elevated liver enzymes and low platelet count), DIC (disseminated intravascular coagulation), cerebral haemorrhage and seizures. This condition requires a special management strategy for better results. Hypertension in pregnancy affects both the mother and the fetus and can lead to maternal and fetal morbidity and mortality if not managed properly.[5]

High cholesterol is a condition that is synonymous with several complications, such as hypertension, heart disease, heart attacks and strokes. One of the things that pregnant women should always pay attention to is the condition of their body health, especially the detection of increased blood pressure during pregnancy and detected sign of preeclampsia. This is obtained by always maintaining food intake and daily activities. Cholesterol levels have not gone unnoticed. Good cholesterol levels are always maintained within normal levels, including during pregnancy.[6]

According to a nutrition expert from Reproductive Medicine Associates, Carolyn Gundell, cholesterol levels in the blood easily rise when women during pregnancy. Please note that in a normal pregnancy, a woman's body will experience changes in fat metabolism. As gestational age increases, cholesterol levels in the blood of pregnant women tend to increase. Levels can even increase by 25-50 percent during the second and third trimesters of pregnancy. Urine protein checking is an examination procedure carried out to assess the amount of protein contained in the urine. If it turns out that there is an excess of protein in the urine, this can indicate certain diseases, especially preeclampsia.[7]

This increase occurs due to hormonal processes in the body. Naturally, cholesterol is also needed by the body during pregnancy for the growth and development of the fetus, to maintain estrogen and progesterone levels, and to prepare the body for the breastfeeding process. This happens because the fat cells of pregnant women increase in size.¹ In addition, the spike in progesterone levels during pregnancy also causes cholesterol to increase. High cholesterol (above normal) can cause pregnancy-induced hypertension and preeclampsia. If this condition is left untreated, this problem can cause harm to the fetus and mother.[8]

The impact of high cholesterol on pregnant women is not only that. Pregnant women who have high cholesterol can also cause problems for their children in the future. The reason is, children born to mothers who have a history of high cholesterol before becoming pregnant are at risk of developing hypertensive disorders as adults. The impact of high cholesterol on pregnant women can also cause narrowing of arteries so that it blocks blood flow or atherosclerosis which can lead to various diseases, such as coronary heart, stroke, to trigger peripheral artery disease.

The habit of Minangkabau people in consuming coconut milk is one of the risk factors for high cholesterol levels, coupled with the perception among the public that when pregnant requires 2 people to eat, then eating becomes 2 portions of this which tends to make the pregnant woman's weight uncontrolled for pregnancy and the risk of high cholesterol pregnant women.

There is a link between high cholesterol levels and the risk of hypertension during pregnancy, and we are less concerned about this trigger of hypertension during pregnancy, so the authors are interested in conducting this study, especially the relationship between cholesterol levels and high pregnancy. The relationship between the incidence of blood pressure.

2. MATERIAL AND METHODS

This study was an observational study with a cross-sectional design. Samples were collected between December 2020 until March 2021 in the work area of North Lintau Buo Health Center. The population in this study were all pregnant women in the work area of North Lintau Buo Health Center. The total sample in this study is 30 respondents, who were selected by consecutive sampling. Cholesterol level assessment is directly assessed during field examination using the auto-check test Easy Touch cholesterol by taking blood samples of pregnant women. Preeclampsia can be detected by using urine protein examination. Then performed a bivariate analysis with the chi-square test.

3. RESULT

The characteristics of respondents in this study are shown in Table 1 and Table 2. In that table, we discussed the characteristics includes age which is divided into 3 groups, and then parity which is divided into 2 groups based on each dependent variable. Univariate analysis was carried out to see the distribution of gestational hypertension events which will be described in

Table 2 and the distribution of preeclampsia levels will be explained in Table 3.

The results of the chi-square statistical test to see the relationship between cholesterol levels and the incidence of gestational

hypertension during pregnancy are shown in Table 5. The results of the chi-square statistical test to see the relationship between cholesterol levels and the incidence of preeclampsia are shown in Table 6.

Table 1. Distribution of gestational hypertension based on age and parity of respondent

Variable	Classification of pregnant		Total n (%)
	Hypertension	Not Hypertension	
Age (years)			
< 20	5	1	6 (20)
20-35	2	8	10 (33,3)
> 35	6	8	14 (46,7)
Parity			
Primipara	7	4	11 (36,7)
Multipara	6	13	19 (63,3)

Table 2. Distribution of preeclampsia based on age and parity of respondent

Variable	Classification of pregnant		Total n (%)
	Preeclampsia	Not Preeclampsia	
Age (years)			
< 20	2	4	6 (20)
20-35	2	8	10 (33,3)
> 35	1	9	14 (46,7)
Parity			
Primipara	4	7	11 (36,7)
Multipara	1	18	19 (63,3)

Table 3. Distribution of the frequency of incidence of gestational hypertension

Variable	Total n (%)
Hypertension	13 (43,3)
Not Hypertension	17 (56,7)

Table 4. Distribution of the frequency of incidence of preeclampsia

Variable	Total n (%)
Preeclampsia	5 (16,7)
Not Preeclampsia	25 (83,3)

Table 5. Relationship of Cholesterol Levels With Gestational Hypertension

Cholesterol	Classification of Pregnant		Total n (%)	p-value
	Hypertension n (%)	Not Hypertension n (%)		
Normal	2 (15,4)	13 (76,5)	15 (50)	0,024
High	11 (84,6)	4(23,5)	15 (50)	
Total	13 (100)	17 (100)	50 (100)	

Table 6. Relationship of Cholesterol Levels With Preeclampsia

Cholesterol	Classification of Pregnant		Total n (%)	p-value
	Preeclampsia n (%)	Not Preeclampsia n (%)		
Normal	3 (15,4)	12(76,5)	15 (50)	0,062
High	2 (84,6)	13(23,5)	15 (50)	
Total	5 (100)	25 (100)	50 (100)	

4. DISCUSSION

Hypertension in pregnancy when the blood pressure is $\geq 140 / 90$ mmHg. Divided into mild-moderate (140 - 159/90 - 109 mmHg) and heavy ($\geq 160 / 110$ mmHg) .8 Hypertension in pregnancy can be classified into 1) pre-eclampsia/eclampsia, 2) chronic hypertension in pregnancy, 3) chronic hypertension accompanied by pre-eclampsia, and 4) gestational hypertension.

When the walls of blood vessels are blocked by plaque (due to high cholesterol levels), the heart will work harder to pump blood to the walls of the clogged arteries and harden. As a result, blood pressure will increase. Over time, high blood pressure can damage blood vessels. Damage to the walls of blood vessels will form a "nest" that is comfortable for excess cholesterol. Therefore, the damage of high blood pressure on the walls of blood vessels will cause the accumulation of cholesterol plaque to become more severe.[9]

Based on the research that has been done, it can be described that there is a relationship between cholesterol levels and the incidence of gestational hypertension, meaning that the higher the cholesterol level of pregnant women, the greater the risk of developing gestational hypertension. This is in line with the theory which states that high cholesterol and hypertension are a close combination for the occurrence of damage to blood vessels and the heart, and the two are interrelated, giving rise to a causal relationship. These two conditions are like the "enemy" of the body, which together damage the heart as a whole.

Not only the heart, blood pressure and high cholesterol can also cause damage to the kidneys, eyes, brain and other organs.

In the table above, it can be seen that there is no relationship between increased cholesterol and the incidence of preeclampsia. It can be concluded that not every increase in cholesterol in the blood will lead to the occurrence of preeclampsia because the incidence of preeclampsia itself is diagnosed when there is a protein in the urine.

5. CONCLUSION

Gestational hypertension is a non-communicable disease, one of which is caused by blockage of blood flow in blood vessels caused by accumulation of blood cholesterol. Besides that, not all cases of preeclampsia are caused by high cholesterol levels in pregnant women. This research still has many shortcomings in its implementation, so it is recommended that further researchers conduct experimental research to determine the relationship of other factors that trigger gestational hypertension and can consider some of the weaknesses in this study to obtain maximum results.

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