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The Relationship Between Cholesterol Levels and the Incidence of Preeclampsia in Pregnant Women at Gang Sehat Community Health Center

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Abstract

Preeclampsia, a dangerous pregnancy complication characterized by elevated blood pressure (>140/90 mmHg), proteinuria, and edema, is a leading cause of maternal mortality. Various risk factors have been identified, including a history of hypertension, age, body mass index (BMI), parity, stress, knowledge level, dietary patterns, exposure to cigarette smoke, and lipid metabolism changes—particularly elevated cholesterol levels. This study aims to analyze the relationship between cholesterol levels and the incidence of preeclampsia among pregnant women at Gang Sehat Community Health Center, Pontianak City. Using a descriptive-analytic design with a cross-sectional approach and purposive sampling technique, the study involved 48 pregnant women with gestational age over 20 weeks during the period of May to June 2024. The results showed that 23 respondents (47.9%) had high cholesterol levels. Interestingly, all 17 respondents (35.4%) who experienced preeclampsia had high cholesterol levels. Meanwhile, among the pregnant women who did not develop preeclampsia, 6 respondents (19.4%) had high cholesterol levels, while 25 respondents (80.6%) had normal cholesterol levels. Statistical analysis using the Chi-Square test revealed a significant correlation between cholesterol levels and the incidence of preeclampsia in pregnant women, with an Asymptotic Significance value of < 0.001 ($p < 0.05$). In conclusion, there is a significant relationship between cholesterol levels and the incidence of preeclampsia in pregnant women at Gang Sehat Community Health Center, Pontianak City.

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1. INTRODUCTION

In measuring the success of maternal and child health programs, a key indicator that can be used is the Maternal Mortality Rate (MMR). MMR is a serious global health issue. Each year, approximately 287,000 women die during pregnancy and childbirth. The majority of maternal deaths occur in low- and lower-middle-income countries, and nearly all of them are actually preventable (WHO, 2023). The Maternal Mortality Rate (MMR) in Indonesia has shown a significant decline in recent years. In 2015, it was recorded at 305 maternal deaths per 100,000 live births. This number decreased to 189 deaths per 100,000 live births in 2020. The progress in reducing MMR needs to be maintained and further improved to reach the target for 2030, which is 70 maternal deaths per 100,000 live births (Kementerian Kesehatan Republik Indonesia, 2022).

In West Kalimantan, the Maternal Mortality Rate (MMR) in 2021 was 214 per 100,000 live births. However, in 2022, it decreased to 142 per 100,000 live births (Dinas Kesehatan Provinsi Kalimantan Barat, 2023). Meanwhile, according to the 2022 profile of the Pontianak City Health Office, the MMR in Pontianak City increased from 6 cases in 2021 to 7 cases in 2022. The leading causes of maternal death in Indonesia in 2022 were pregnancy-induced hypertension with 801 cases, hemorrhage with 741 cases, heart disease with 232 cases, and other causes accounting for 1,504 cases (Kementerian Kesehatan Republik Indonesia, 2022).

Hypertension during pregnancy is a common condition, occurring in approximately 6–10% of all pregnancies (Agrawal, & Wenger, 2020; Beech, & Mangos, 2021; Khedagi, & Bello, 2021). It can increase the risk of complications for the mother, fetus, and newborn. Chronic hypertension in pregnancy refers to a condition that occurs before pregnancy or typically before 20 weeks of gestation. Chronic hypertension with superimposed preeclampsia is a condition where chronic hypertension is accompanied by preeclampsia. Gestational hypertension refers to high blood pressure that develops after 20 weeks of gestation without the presence of preeclampsia (Alatas, 2019). Preeclampsia is one of the pregnancy complications that can lead to maternal death. It is estimated to be responsible for around 70,000 maternal deaths each year and is also associated with increased maternal mortality and morbidity worldwide (Martilova & Samara, 2021). Symptoms of preeclampsia include weight gain, swelling in the feet or hands, high blood pressure, and the presence of protein in the urine. Preventive measures for preeclampsia include consuming a healthy diet, getting adequate rest, and attending regular prenatal check-ups (Ahmad & Nurdin, 2019; Aprilia, et al. 2021; Agustina, Sukarni, & Amalia, 2022).

According to Martilova & Samara (2021) an imbalance in lipid levels in pregnant women with preeclampsia may be one of the characteristics of the condition. In early pregnancy, maternal triglyceride levels increase. This increase is followed by a rise in low-density lipoprotein (LDL). To compensate for the increase in LDL, high-density lipoprotein (HDL) levels also rise. HDL is a type of lipoprotein that has anti-inflammatory effects. In pregnant women with preeclampsia, the increase in triglycerides and LDL is not accompanied by a corresponding rise in HDL levels. As a result, vascular endothelial dysfunction occurs, which can lead to hypertension, proteinuria, and edema. In pregnant women with preeclampsia, the elevation of triglycerides and LDL without a compensatory increase in HDL may result from lipid metabolism changes involved in the pathogenesis of preeclampsia. Elevated triglycerides and LDL, along with decreased HDL levels, have been associated with the vascular endothelial dysfunction observed in preeclampsia. Studies have shown that alterations in lipid metabolism, including reduced HDL levels, contribute to the development of preeclampsia.

Based on research findings, measurements of cholesterol levels in early pregnancy (4–20 weeks) show changes in cholesterol levels that are associated with an increased risk of developing preeclampsia (Martilova & Samara, 2021). The incidence of preeclampsia at Gang Sehat Community Health Center is not among the top 10 most common diseases. However, data from the Maternal and Child Health (MCH) report shows that preeclampsia cases increased from 44 cases in 2022 to 54 cases in 2023. Meanwhile, lipid profile testing is not part of the routine examinations for pregnant women. This study aims to analyze the relationship between cholesterol levels and the incidence of preeclampsia among pregnant women at Gang Sehat Community Health Center, Pontianak City.

2. METHOD

This study uses a descriptive cross-sectional design aimed at providing a systematic, factual, and thorough description of a specific phenomenon or variable. Additionally, this study aims to analyze the relationship between the variables under investigation using an observational approach or data collection at a specific point in time, known as a point-in-time approach or a concurrent study (Sugiyono, 2019).

The sample used consists of pregnant women with a gestational age of over 20 weeks. The sample will be determined using purposive sampling with predetermined criteria. This study uses three types of research data: quantitative data (based on nature), primary data (based on source), and cross-sectional data (based on time). The collected data will undergo univariate analysis using descriptive statistics and bivariate analysis using the chi-squared test. If a p-value of less than 0.05 is found, it indicates that the variables being studied are related.

This research has also obtained ethical approval from the Ethics Commission of the Health Polytechnic of the Pontianak Ministry of Health with number: 248/KEPK-PK.PKP/V/2024.

3. RESULTS AND DISCUSSION

Table 1. Distribution of Pregnancy Age, Parity Status, and Education Level with Preeclampsia Incidence and Cholesterol Levels.

Variable	Frequency (n)	Total (%)	Preeclampsia	Cholesterol	Preeclampsia	Cholesterol
			Preeclampsia (n)	No Preeclampsia (n)	Preeclampsia (n)	No Preeclampsia (n)
Age Group (Years)						
15–20	3	6.3%	0	3	0	3
21–25	11	22.9%	3	8	3	8
26–30	19	39.6%	7	12	9	10
31–35	12	25%	5	7	8	4
36–40	3	6.3%	2	1	3	0
Pregnancy Age						
20–27 Weeks	18	37.5%	5	13	6	12
28–40 Weeks	30	62.5%	12	18	17	13
Parity Status						
Primigravida	23	47.9%	4	19	5	18
Multigravida	23	47.9%	11	12	16	7

Grande Multigravida	2	4.2%	2	0	2	0
Education Level						
Elementary School	3	6.3%	2	1	3	0
Junior High School	4	8.3%	1	3	1	3
Senior High School	24	50%	5	19	9	15
Higher education/ equivalent	17	35.4%	9	8	10	7
Total	48	100%	17	31	23	25

Based on table 1 the results of the study, data on age were obtained from 48 respondents. The distribution of respondents by age was as follows: 3 respondents (6.3%) were aged 15–20 years, 11 respondents (22.9%) were aged 21–25 years, 19 respondents (39.6%) were aged 26–30 years, 12 respondents (25%) were aged 31–35 years, and 3 respondents (6.3%) were aged 36–40 years. The study results show that the highest percentage of preeclampsia cases and elevated cholesterol levels occurred in the age group of 26–30 years. The data collected from the 48 pregnant women shows several important factors related to cholesterol levels, preeclampsia, blood pressure, and urine protein status. Of the 48 women, 47.9% (23 women) had high cholesterol levels, while 52.1% (25 women) had normal cholesterol levels. Regarding preeclampsia incidence, 35.4% (17 women) were diagnosed with preeclampsia, while the remaining 64.6% (31 women) did not experience the condition.

In terms of blood pressure, 41.7% (20 women) had hypertension, indicating a significant portion of the sample experienced elevated blood pressure, while 58.3% (28 women) had normal blood pressure. Additionally, regarding urine protein, 35.4% (17 women) tested positive for protein in the urine, a common sign of preeclampsia, while 64.6% (31 women) had negative urine protein results. These findings indicate that a significant proportion of the respondents with preeclampsia also have high cholesterol, hypertension, and proteinuria, underlining the relationship between these factors in the context of maternal health during pregnancy. The presence of these conditions suggests an increased risk for complications such as preeclampsia, which further emphasizes the need for careful monitoring and management of cholesterol levels, blood pressure, and proteinuria during pregnancy.

Table 2. Descriptive Data of Cholesterol Levels

Variable	Number of Variables	Minimum	Maximum	Mean	Standard Deviation
Cholesterol Level	48	128.00	326.00	215.79	56.30

Table 2 shows that the results of the study on 48 respondents show that the average cholesterol level of pregnant women is 215.79, with a minimum value of 128 and a maximum value of 326. The standard deviation of the cholesterol level is 56.30, indicating a relatively large variation in cholesterol levels among the pregnant women in the study. The majority of the respondents had cholesterol levels in the normal category, with 25 women (47.9%) falling into this group, while 23 women (52.1%) had high cholesterol levels. This suggests that nearly half of the pregnant women in the study have high

cholesterol, which could be an important risk factor for maternal health conditions such as preeclampsia.

Table 3. Distribution of Cholesterol Levels, Preeclampsia Incidence, Blood Pressure, and Urine Protein in Respondents

Variable and Category	Frequency (n)	Total (%)
Cholesterol Level		
High	23	47.9%
Normal	25	52.1%
Preeclampsia		
Yes	17	35.4%
No	31	64.6%
Blood Pressure		
Hypertension	20	41.7%
No Hypertension	28	58.3%
Urine Protein		
Positive	17	35.4%
Negative	31	64.6%

Table 3 shows that the data from the 48 respondents highlights the distribution of various factors associated with preeclampsia risk. Cholesterol levels show that nearly half of the respondents (47.9%) had high cholesterol, while the remaining 52.1% had normal cholesterol levels. As for preeclampsia incidence, 35.4% of the respondents were diagnosed with preeclampsia, while the majority, 64.6%, did not experience it. In terms of blood pressure, 41.7% of the women had hypertension, and the rest, 58.3%, had normal blood pressure. Regarding urine protein, 35.4% tested positive for proteinuria, a common marker for preeclampsia, while the remaining 64.6% had negative results. These findings suggest a substantial relationship between high cholesterol, hypertension, proteinuria, and preeclampsia, indicating that women with these conditions are at a higher risk of developing preeclampsia. This reinforces the importance of monitoring these factors during pregnancy to prevent complications and ensure better maternal and fetal health outcomes.

Table 4. Relationship between Cholesterol Levels and Preeclampsia Incidence in Pregnant Women.

Test	Value	df	Asymptotic Significance (2-sided)	Exact Sig (2-sided)	Exact Sig (1-sided)
Pearson Chi-Square	28.612a	1	<0.001		
Continuity Correction	25.471	1	<0.001		
Likelihood Ratio	35.996	1	<0.001		
Fisher's Exact Test				<0.001	<0.001
Linear-by-Linear Association	28.015	1	<0.001		
Number of Valid Cases	48				

Note:
a. 0 cells (0.0%) have expected counts less than 5. The minimum expected count is 8.15.
b. Computed only for a 2x2 table.

Table 4 shows a significant relationship between high cholesterol levels and the occurrence of preeclampsia in pregnant women at Puskesmas Gang Sehat. The Chi-Square and Continuity Correction results both yielded p-values of <0.001, confirming that the association between these two variables is statistically significant. This suggests that pregnant women with high cholesterol levels have an increased risk of developing preeclampsia compared to those with normal cholesterol levels.

DISCUSSION

The study results show that out of 48 respondents, 23 women (47.9%) had high cholesterol levels, while 25 women (52.1%) had non-elevated cholesterol levels. The increase in cholesterol during pregnancy for some of these pregnant women is physiological, serving as an adaptive response of the mother's body, which requires cholesterol to meet the needs of the fetus (Cantin et al., 2020). Abnormal changes in cholesterol levels are observed to be more significant than normal changes in pregnancies that end in preeclampsia. Therefore, dyslipidemia is considered to be associated with an increased risk of preeclampsia (Martilova & Samara, 2021). The results of the urine protein test showed that out of 48 respondents, 17 women (35.4%) had positive results, while 31 women (64.6%) had negative results. Regarding blood pressure, 20 respondents (41.7%) had high blood pressure, and 28 respondents (58.3%) had normal blood pressure. According to the doctor's diagnosis, 17 pregnant women (35.4%) were diagnosed with preeclampsia, while 31 women (64.6%) did not have preeclampsia.

Pregnant women who experience hypertension are at risk of organ damage or abnormalities, which makes the body work harder, potentially leading to edema and proteinuria as a response to this tissue damage. Premature delivery, stillbirth, and neonatal death can also be caused by hypertension during pregnancy. This study supports these findings, highlighting the significant impact of hypertension on maternal and fetal health outcomes Ningrum & Nurhoeriyah (2015) this study found a correlation between the prevalence of preeclampsia in new mothers and a history of hypertension. The descriptive data obtained from this research includes variables such as respondent age, gestational age, parity status, and educational level, all of which are associated with risk factors for preeclampsia. From the descriptive data regarding respondent age, 66.7% of respondents aged 36-40 experienced preeclampsia. This highlights the importance of considering age, particularly advanced maternal age, as a significant factor in the development of preeclampsia. The increase in blood pressure with age, especially in those over 35, elevates the risk of hypertension and eclampsia, among other complications. Therefore, it can be stated that older women are more likely to experience complications during childbirth compared to younger women. This underscores the importance of closely monitoring older pregnant women for potential health risks during pregnancy and delivery (Situmorang, 2016).

The descriptive data from the study also shows that the highest frequency of preeclampsia occurs during the gestational age of 28–40 weeks, which is typically when preeclampsia manifests in the third trimester of pregnancy. According to Marniati, Rahmi & Djokosujono, (2016), preeclampsia becomes more common as the gestational age increases. Although it can occur earlier, this condition typically emerges in the third trimester. Other descriptive data reveals that the highest occurrence of preeclampsia is found in grande multigravida status, followed by multigravida. This supports the findings of Nursal, Tamela, & Fitrayeni, (2015), which suggest that multigravida women have a higher risk of preeclampsia compared to primigravida women. Women with one or more previous pregnancies are at a higher risk of experiencing reproductive function disorders due to the demands of taking care of children and households, feeling fatigued, and

neglecting proper nutrition and physical health (Situmorang, 2016). Therefore, both primigravida and multigravida women should utilize and adhere to family planning counseling provided by healthcare providers at health facilities. This will allow them to learn and utilize safe contraceptive methods to regulate the number of pregnancies and reduce the risk of preeclampsia.

Further descriptive data show that preeclampsia occurrences are highest among women with either elementary school education or higher education. This study found that pregnant women with both high and low levels of education have an equal opportunity to experience preeclampsia (Nursal, Tamela, & Fitrayeni, 2015). The results of this study indicate a significant relationship between cholesterol levels and the occurrence of preeclampsia in pregnant women, as evidenced by the Chi-Square test analysis. The analysis shows that the Asymptotic Significance value is below 0.001 ($p<0.05$), which confirms that the hypothesis of a relationship between cholesterol levels and preeclampsia occurrence in pregnant women is accepted. This result aligns with Martilova & Samara (2021), where changes in cholesterol levels during the first 4-20 weeks of pregnancy are associated with the development of preeclampsia risk. Similar research by Laili & Amalia (2021) shows that high cholesterol levels in the blood of pregnant women during the third trimester increase the risk of preeclampsia.

The initial condition of preeclampsia involves an increase in triglyceride levels in the liver via VLDL. Triglycerides then enter the bloodstream in response to estrogen and liver lipase activity (Kalar, 2012; Kashinakunti, 2010). A decrease in lipoprotein lipase activity and the development of insulin resistance results in a decline in lipid degradation in tissues, leading to an increase in triglycerides. This condition causes LDL accumulation in the blood vessels (Herrera & Desoye, 2016). The accumulated total LDL cholesterol becomes oxidized and is recognized by macrophage receptors, forming foam cells that resemble atherosclerotic plaques in blood vessels, representing an inflammatory response. As LDL levels increase, HDL typically functions as an anti-inflammatory agent. In preeclampsia, however, when LDL levels rise, HDL decreases, causing endothelial damage that may result in hypertension, proteinuria, and edema. In pregnant women with preeclampsia, the increase in triglycerides and LDL without a corresponding increase in HDL may occur due to lipid metabolism changes involved in the pathogenesis of preeclampsia (Martilova & Samara, 2021).

4. CONCLUSION

In conclusion, there is a significant relationship between cholesterol levels and the incidence of preeclampsia in pregnant women at Gang Sehat Community Health Center, Pontianak City. Further research could explore the biological mechanisms underlying the relationship between dyslipidemia and preeclampsia, such as the role of inflammation, oxidative stress, and endothelial dysfunction.

REFERENCES

Agrawal, A., & Wenger, N. K. (2020). Hypertension during pregnancy. *Current hypertension reports*, 22(9), 64. https://doi.org/10.1007/s11906-020-01070-0

Agustina, P. M., Sukarni, D., & Amalia, R. (2022). Faktor-Faktor yang Berhubungan dengan Kejadian Preeklamsia di RSUD Martapura Okut Tahun 2020. *Jurnal Ilmiah Universitas Batanghari Jambi*, 22(3), 1389-1394. Retrieved from: http://ji.unbari.ac.id/index.php/ilmiah/article/view/2513

Ahmad, Z., & Nurdin, S. S. I. (2019). Faktor Risiko Kejadian Preeklamsia Di Rsia Siti Khadijah Gorontalo. *Akademika*, 8(2), 150-162.

Aprilia, M. U., Windayanti, H., Sari, N. M. P., Esti, M. W., Rahmayanti, D. P., Erwinda, W., ...

& Susilowati, N. R. (2021). Literature review: Faktor Resiko Kejadian Preeklampsia Berat. In Call for Paper *Seminar Nasional Kebidanan,* pp. 59-71. Retrieved from: https://jurnal.unw.ac.id/index.php/semnasbidan/article/view/1345

Alatas, H. (2019). Hipertensi pada kehamilan. *Herb-Medicine Journal: Terbitan Berkala Ilmiah Herbal, Kedokteran Dan Kesehatan,* 2(2), 27-51. https://doi.org/10.30595/hmj.v2i2.4169

Beech, A., & Mangos, G. (2021). Management of hypertension in pregnancy. *Australian prescriber*, 44(5), 148–152. https://doi.org/10.18773/austprescr.2021.039

Cantin, C., Fuenzalida, B., & Leiva, A. (2020). Maternal hypercholesterolemia during pregnancy: potential modulation of cholesterol transport through the human placenta and lipoprotein profile in maternal and neonatal circulation. *Placenta,* 94, 26-33. c

Dinas Kesehatan Provinsi Kalimantan Barat. (2023). *Profil Kesehatan Provinsi Kalimantan Barat Tahun 2022*. Pontianak: Dinas Kesehatan Provinsi Kalimantan Barat.

Herrera, E., & Desoye, G. (2016). Maternal and fetal lipid metabolism under normal and gestational diabetic conditions. *Hormone molecular biology and clinical investigation*, 26(2), 109-127. https://doi.org/10.1515/hmbci-2015-0025

Kalar, M. U., Kalar, N., Mansoor, F., Malik, A. R., Lessley, T., Kreimer, S., ... & Bilal, M. (2012). Preeclampsia and lipid levels—a case control study. *Int J Collab Res Internal Med Public Health*, 4(10), 1738-1745.

Kashinakunti, S. V., Sunitha, H., Gurupadappa, K., & Manjula, R. (2010). Lipid profile in preeclampsia—a case–control study. *Journal of clinical and diagnostic Research*, 4(4), 2748-2751.

Kementerian Kesehatan Republik Indonesia. (2022). *Profil Kesehatan Indonesia Tahun 2021.* Jakarta: Kementerian Kesehatan Republik Indonesia.

Khedagi, A. M., & Bello, N. A. (2021). Hypertensive disorders of pregnancy. *Cardiology clinics*, 39(1), 77-90. https://doi.org/10.1016/j.ccl.2020.09.005

Laili, U., & Amalia, R. (2021). Hubungan Kolesterol Pada Ibu Hamil dengan Kejadian Pre Eklamsi. *Dinamika Kesehatan: Jurnal Kebidanan dan Keperawatan,* 12(1), 306-312. Retrieved from: https://ojs.dinamikakesehatan.unism.ac.id/index.php/dksm/article/view/661

Marniati, M., Rahmi, N., & Djokosujono, K. (2019). Analisis Hubungan Usia, Status Gravida dan Usia Kehamilan dengan Pre-Eklampsia pada Ibu Hamil di Rumah Sakit Umum dr. Zaionel Abidin Provinsi Aceh Tahun. *Journal of Healthcare Technology and Medicine*, 2(1), 99-109. Retrieved from: https://jurnal.uui.ac.id/index.php/JHTM/article/view/353

Martilova, S., & Samara, T. D. (2021). Hubungan kadar kolesterol darah dengan risiko terjadinya preeklamsia. *Jurnal Biomedika Dan Kesehatan*, 4(4), 178-184. https://doi.org/10.18051/JBiomedKes.2021.v4.178-184

Ningrum, E.W., & Nurhoeriyah, N. (2015). Hubungan antara Riwayat Penyakit Dm dengan Kejadian Preeklamsia pada Ibu Bersalin di RSUD Prof. Dr. Margono Soekardjo Purwokerto. *Viva Medika: Jurnal Kesehatan, Kebidanan dan Keperawatan*, 8(2), 18-29.

Nursal, D. G. A., Tamela, P., & Fitrayeni, F. (2015). Faktor risiko kejadian preeklampsia pada ibu hamil di RSUP dr. M. Djamil Padang tahun 2014. *Jurnal Kesehatan Masyarakat Andalas,* 10(1), 38-44. https://doi.org/10.24893/jkma.v10i1.161

Situmorang, T. H., Damantalm, Y., Januarista, A., & Sukri, S. (2016). Faktor-faktor yang berhubungan dengan kejadian PreEklampsia pada Ibu Hamil di Poli KIA RSU Anutapura Palu. *Healthy Tadulako Journal (Jurnal Kesehatan Tadulako)*, 2(1), 34-44. Retrieved from: http://jurnal.fk.untad.ac.id/index.php/htj/article/view/21

Sugiyono, S. (2019). *Metodologi Penelitian Kuantitatif, Kualitatif, Dan R&D*. Bandung: Alfabeta.

WHO. (2025). *Maternal Mortality [Internet]*. WHO. Retrieved from: https://www.who.int/news-room/fact-sheets/detail/maternal-mortality