RESEARCH
www.commprac.com
ISSN 1462 2815

DIFFERENCES IN LOW DENSITY LIPOPROTEIN LEVELS BETWEEN PREECLAMPSIA AND NORMAL PREGNANCY

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DOI: 10.5281/zenodo.12743029

Abstract

Preeclampsia is a major problem in the field of reproductive health that requires special attention because preeclampsia causes high rates of maternal morbidity and mortality. This study is an observational study with a cross sectional comparative study design. The research was conducted from June 2022 - November 2022. The research was conducted at the Emergency Department (IGD) of obstetrics at Dr.M.Djamil Hospital Padang, Nanggalo Health Center. The study population was 3 trimester pregnant patients with preeclampsia and normal pregnancy who came to the obstetric emergency room of Dr. M.Djamil Hospital Padang, Nanggalo Health Center. The number of samples used in this study was the number of samples for each group of 24 people, so that the total sample of the two groups was 48 people. The descriptive analysis method is multiple linear regression analysis with the help of the SPSS version 25 application. Sampling was carried out by consecutive sampling, namely every pregnant patient in the 3rd trimester with preeclampsia and normal pregnancy who came to the obstetric emergency room of Dr. M Djamil Hospital, Nanggalo Health Center then informed consent was given to the patient or patient's family about the research, how to do the research, the benefits of research, and the risks as a participant. In this study, the average LDL level in normal pregnant women was found to be optimal at 95.5 ± 16.4 mg/dl even though it had a wide range of 69-138 mg/dl. During normal pregnancy, total cholesterol, HDL-C, triglyceride, and LDL-C levels can be found to be optimal.

Keywords: Low Density Lipoprotein Levels, Preeclampsia, Normal Pregnancy.

BACKGROUND

Preeclampsia is a main problem in the reproductive health part which is needed to pay attention specifically. It causes high maternal morbidity and mortality rates. It also includes three main factors of maternal mortality in Indonesia except bleeding and infection.

Based on the inter – census population survey (SUPAS) in 2015, maternal mortality in Indonesia is still high. It was around 305 per 100.000 live births. This rate is still far away from the target in Indonesia in 2024 which is 183/100.000 live births.

Maternal mortality in west sumatra in 2017 was 113 cases. This maternal mortality was 23,9% and it was caused by preeclampsia. In RSUP Dr. M.Djamil Padang in 2015, there were 32,5% because of it and it increased in 2016 became 33%. In 2017, from January – June, there were 233 cases of it.

There are many theories which explains about pathophysiology happens, such as; abnormalities in placental vascularization, ischemic theory, free radicals and endothelial dysfunction, theory of immunological intolerance between mother and

fetus, cardiovascular adaptation theory, genetic deficiency theory, nutritional deficiency theory, and inflammation theory.

1) LDL in preeclampsia

Preeclampsia is an effect of impaired immune response and hormones that develops during pregnancy. So that it causes impaired uterine vascular remodeling disorders and endothelial dysfunction.

The changing of lipid profile is one of the factors that relates to preeclampsia endothelial dysfunction. In preeclampsia, there is a disruption in the vascularization of the fetoplacental unit which results in placental ischemia. When it happens, the placenta will produce lipid peroxide which enters and binds with lipoproteins, especially LDL. In low levels of lipid peroxide, it is a normal event in cell or tissue life.

In the beginning stage of preeclampsia is found the changing of mitochondrial structure. Mitochondrial is a source of radical oxygen and enriched with unsaturated fatty acids. So, the placenta can be the biggest source of the production of lipid peroxide in pregnancy. The process of lipid peroxide increases as appropriate with the increasing pregnancy age even at the end of pregnancy. The activity will be doubled.

2) LDL in normal pregnancy

Pregnancy is a dynamic metabolic condition. In the beginning of pregnancy, maternal metabolism is anabolic. The purpose of it is to keep nutrients in sufficient quantities. In the middle of period of pregnancy until the end of it where the fetal growth rate increases, the mother's metabolism changes to become catabolic and is accompanied by increased lipid transport to the fetus.

In normal pregnancy, there are things that happen to stabilize blood pressure as following:

1. Angiotensin-II (part of α_2 globulin) is broken by the placenta so that the blood pressure is stable.
2. Vascular system becomes refractory, selectively against agent *pressor* angiotensin-II. This thing is caused by vascular prostaglandin I_2 and nitric oxide (NO) which have vasodilator effects. Interaction between two systems stabilizes blood pressure in normal pregnancy. *Vascular Endothelial Growth Factor* (VEGF) involves the increase to restore uteroplacental blood flow to normal level.

METHODE

Taking samples was done by simple random sampling. The population of this study was employees of RSUP Dr. M. Djamil Padang. Then, the samples of Nanggalo community health center were 110 respondents.

Questionnaire with likert scale was used as the instrument of this study. For the method of analysis, descriptive analysis such as; multiple linear regression analysis with the help of SPSS application version 25.

The technique analysis in this study was validity test, reliability test, hypothesis test, and multiple linear regression analysis. Figure 1 showed the framework of thinking in this study.

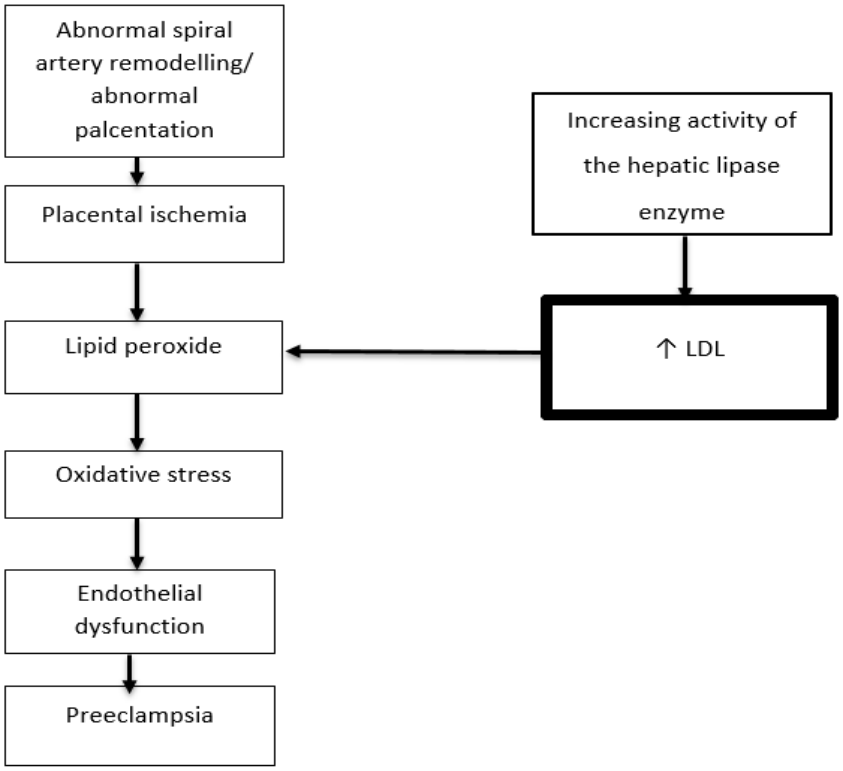

Figure 1: framework of thinking

Hypothesis

There were differences in LDL levels between pregnancy with preeclampsia and normal pregnancy.

RESULTS AND DISCUSSION

A. Respondents characteristics

Table 1: General Characteristic of Sample

Characteristic	Preeclampsia		Normal pregnancy	
	Mean ±SD	f(%)	Mean ±SD	f(%)
Age (year)	29,5±5,2		28,6±4,7	
BMI (Kg/m$^{2)}$	25,7±4,9		23,1±2,5	
Gestational age (week)	34,4 ± 3,2		35,9±3,2	
Parity				
Primipara		18(72)		15(60)
Multiparous		7(28)		10(40)

In table 1 was got average age in preeclampsia cases was higher than normal pregnancy which was 29,5±5,2 years in preeclampsia cases and 28,6±4,7 for normal pregnancy. The average BMI for preeclampsia is higher than normal pregnancy. It was 25,7±4,9 kg/m^2 for preeclampsia cases and 23,1±2,5 for normal pregnancy. The average gestational age in preeclampsia is lower than normal pregnancy. It was 34,4 ± 3,2 weeks for preeclampsia and 35,9±3,2 for normal pregnancy. Primiparous parity for preeclampsia cases was higher than normal pregnancy. It was (72%) for preeclampsia cases and (28%) for normal pregnancy. Arwan et al (2020) also found the same thing in RSUP Dr. M. Djamil Padang where 63,7% of patients with PEB was

a primigravida. It was the same with Benfateh et al (2018) where half of patients were primipara. It is also related with the tendency of immunological incompatibility between the fetal placenta and maternal tissue for the first pregnancy.

B. LDL level in preeclampsia patients

Table 2: LDL levels in preeclampsia level

Group	LDL level (mg/dL)	
	Mean ±SD	Min-max
Preeclampsia	134,7±19,4	99-169

In table 2, it could be seen that the average level of LDL for preeclampsia in this study was 134,7±19,4 mg/dl with the lowest level was 99 mg/dl and the highest was 169 mg/dl. White et al (2019) found that the same thing with the study that has been done by the researcher for 28 patients or preeclampsia in the study entitled “Serum Lipid Profile in Pregnancy and Postpartum Severe Preeclampsia”. In this study, there was an increase of LDL level for preeclampsia women when they were pregnant where the level decreased after the patients gave birth. In pregnant women with preeclampsia the average LDL was 140,5 mg/dl where the average of LDL became 102,5 mg/dl after patients gave birth. Preeclampsia had three stages of disease that started from imbalance between placental factors and the mothers’ adaptation to them. This disease started with imperfect maternal tolerance to allogeneic trophoblast (stage 1) which was poor placentation which caused decreasing of placental perfusion and poor spiral artery remodelling (stage 2). Because of that, the placenta which had oxidative stress released antiangiogenic from trophoblast (excessive maternal inflammatory response) (stage 3).

C. LDL level in normal pregnancy

Tabel 3: LDL level in normal pregnancy

Group	LDL level (mg/dL)	
	Mean ±SD	Min-max
Normal pregnancy	95,5±16,4	69-138

In table 3, it could be seen the average level of LDL of normal pregnancy in this study 95,5±16,4 mg/dl with the lowest level was 69 mg/dl and the highest level was 138 mg/dl. In this study, the LDL level of normal pregnancy was optimal even though it has a wide range of 69-138 mg/dl. The level of total cholesterol, HDL-C, triglycerides, and LDL-C could be found increasing.

D. The differences of LDL level between preeclampsia case and normal pregnancy.

Table 4: Normality test

	Kelompok	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
LDL	PEB	0,147	25	0,174	0,949	25	0,233
	Normal	0,194	25	0,017	0,896	25	0,015

In the normality test, the data were distributed normally because the significance score in the group of preeclampsia <0,05 so that there was data transformation and normality test was done back.

Table 5: Normality test after data transformation

	Group	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
LDL transformation	PEB	0,159	25	0,101	0,936	25	**0,119**
	Normal	0,178	25	0,040	0,921	25	**0,054**

After data transformation, a significant score in two groups were >0,05 which 0,119 and 0,054 it could be concluded that the data was distributed normally so t-test could be done in bivariate analysis.

Table 6: The differences LDL level between preeclampsia case and normal pregnancy.

Group	LDL level (mg/dL) Mean ±SD	*P-Value
Preeclampsia	134,7±19,4	0,000
Normal pregnancy	95,5±16,4	

In table 6, the LDL level for preeclampsia was higher than normal pregnancy. It was 134,7±19,4 versus 95,5±16,4. Statistically, there was a difference, it was (p <0,05). In this study, there was a significant difference between LDL preeclampsia patients with normal pregnancy. It was the same with the finding of Dahlan et al (2018) in the research entitled "Hypertriglyceridemia is Associated with the Incidence of Preeclampsia". This study was done for 115 pregnant women aged 24-28 weeks which was followed until delivery where LDL was measured at that gestational age and the outcome was assessed until mothers gave birth. At the end of the study, it was found that 6,9% samples had preeclampsia and 93,1% did not have. In that study, LDL for preeclamptic pregnant women was higher than normal pregnancy with the average as following; 177.38 ± 55.38 vs 157.24 ± 35.08. The LDL level preeclamptic pregnant women vs normal pregnancy were 133,92 ± 38.77 vs 112.41 ± 36.08. The reason for preeclampsia was from decreasing uteroplacental perfusion as the reason for abnormal remodeling of the spiral arteries. Placental ischemia caused the increasing synthesis of endothelin, thromboxane, and various chemical mediators which affected endothelium and caused maternal syndrome. Spracklen's study was a meta – analysis study which was followed by some studies in some countries (Asian, Europe, and north america) with many factors that impacted LDL level meanwhile the study was done in one place where there was possibility of racial bias could be omitted. Willey et al found that LDL varied between races because of the difference of lipid metabolism which affected genetics so that this thing could be a factor of the result of study between this study and the study that has been done by Spracklen et al.

CONCLUSION

1) It was that higher LDL level of the case of pregnancy with preeclampsia.
2) It was the LDL level of the case of normal pregnancy and pregnancy with preeclampsia.
3) There were differences of LDL level between the cases of pregnancy with preeclampsia with normal pregnancy.

References

1) Manuaba. 2010. Ilmu Kebidanan Penyakit Kandungan. Jakarta: EGC

2) Salimi S, Mashhadi FF, Naghavi A, et al. 2014. Different profile of serum leptin between early onset and late onset preeclampsia. Hindawi Publishing Corporation Disease Markers: 1-7.

3) Data rekam medik RSUP Dr M Djamil Padang tahun 2015.

4) Data rekam medik RSUP Dr M Djamil Padang tahun 2016.

5) Data rekam medik RSUP Dr M Djamil Padang tahun 2017.

6) Simanaviciute D. The use of Uterine Artery Doppler in Pregnancy Induced Hipertensive disorder. Department of Obstetri and Gynaecology. Lithuania. 2005.

7) Bolin M. 2012. Pre-eclampsia- possible to predict? a biochemical and epidemiological study of pre-eclampsia. Dissertation, Universitatis Upsaliensi

8) Helena E, Yusrawati, Eva C. 2016. Perbedaan Rerata Kada Profil Lipid pada Preeklamsia dengan Kehamilan Normal pada Etnik Minangkabau. Jurnal Kesehatan Andalas 5(1).

9) Singh S, Euliano TY, Michalopoulus K, et al. 2018. Photoplethysmography and Heart Rate Variability for the Diagnosis of Preeclampsia. Anesth Analg 126(3): 913-919

10) Grum T, Seifu A, Abay M, Angesom T, Tsegay L. Determinants of pre-eclampsia/Eclampsia among women attending delivery Services in Selected Public Hospitals of Addis Ababa, Ethiopia: A case control study. BMC Pregnancy Childbirth. 2017;17(1):1–7.

11) White PFI, Wantania JJE, Mewengkang ME. Serum Lipid Profile in Pregnancy and Postpartum Severe Preeclampsia. Indones J Obstet Gynecol. 2019;7(1):15–20.

12) Spracklen CN, Smith CJ, Saftlas AF, Robinson JG, Ryckman KK. Maternal hyperlipidemia and the risk of preeclampsia: A meta-analysis. Am J Epidemiol. 2014 Aug 15;180(4):346–58.

13) Tesfa E, Nibret E, Munshea A. Maternal lipid profile and risk of pre-eclampsia in African pregnant women: A systematic review and meta-analysis. PLoS One. 2021 Dec 1;15(12 December).

14) Dahlan IS, Tahir M, Lukas E, Maisuri S, Chalid T. Hypertriglyceridemia is Associated with the Incidence of Preeclampsia. Maj Obstet Ginekol Indones . 2018;

15) Willey JZ, Rodriguez CJ, Carlino RF, Moon YP, Paik MC, Boden-Albala B, et al. Race-ethnic differences in the association between lipid profile components and risk of myocardial infarction: The Northern Manhattan Study. Am Heart J. 2011 May;161(5):886–92.

16) Dutta DC. Chapter 17: Hypertensive Disorders in Pregnancy. In: Dutta DC. Konar H, ed. DC Dutta's Textbook of Obstetrics. 7th ed. New Delhi: Jaypee Brothers Medical Publishers; 2014. p.219-26.

17) Belo L, Caslake M, Gaffney D, Santos-Silva A, Pereira-Leite L, Quintanilha A. Changes in LDL size and HDL concentration in normal and preeclamptic pregnancies. Rebelo Diabetes Care. 2002 ;26(9):2588-94

18) Jayante, De Kumar, A. Saha P. Study of serum lipid profile in pregnancy induced hypertension. Indian Journal of Clinical Biochemistry. 2016; 21(2):165-8.

19) de Assis SMA, Seguro AC, Helou CMB. Effects of maternal hypercholesterolemia on pregnancy and development of offspring. Pediatr Nephrol. 2013;(18):328.