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Research Article

Dyslipidemia and Preeclampsia: Pathogenesis or Co-Incidence?

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ABSTRACT

Background: Recently the role of lipids in the pathogenesis of preeclampsia is considered. We aimed to assess the association between maternal and cord blood lipid and preeclampsia, especially in pregnant women without any risk factors.

Methods: This cross-sectional study was conducted from 2014 to 2016 on 116 terms pregnant women in an educational hospital in Zanjan- Iran. All participants were 18-35 years of age. The study was approved by the Ethics Committee of Zanjan University of Medical Sciences, and written informed consent was obtained from the entire participant. A total of 58 pregnant women with preeclampsia and 58 healthy pregnant women were included in the study. Cord blood samples were collected immediately after the caesarian section and were taken from the umbilical vein. Controls, which were selected from the study population, tried to be matched to cases by age, sex of a fetus, and gestational week. We tried to reduce confounding factors as possible by selecting our participants carefully.

Results: There were no significant differences in maternal age, birth weight, and neonatal gender between the two groups. Serum total cholesterol, Triglycerides (TG), Low-Density Lipoprotein Cholesterol (LDL-C), and High-Density Lipoprotein Cholesterol (HDL-C) concentrations were significantly lower in preeclamptic women than in the healthy pregnant women, but no difference was observed in cord blood sample between groups.

Conclusion: Our findings suggest a relationship between low lipid value and preeclampsia. We think prepregnancy factors might be involved in dyslipidemia associated with Preeclampsia. Further studies are needed to explore potential mechanisms.

Keywords: Hyperlipidemia; Preeclampsia; Pregnancy

INTRODUCTION

Preeclampsia is a new onset of hypertension diagnosed after 20 weeks of gestation and is estimated to complicate 5% - 8% of pregnancies. It has been defined by a blood pressure greater than 140/90 mmHg and proteinuria [1-3]. Preeclampsia is a major cause of maternal mortality and morbidity and also strongly associated with 500,000 infant mortality annually [4]. Impaired trophoblast differentiation and invasion is the characteristic point of preeclampsia that leads to high resistance placental arterial and more vasoconstriction and ischemia and oxidative stress [5,6]. The exact etiology of this disease remains unknown [7]. However, risk factors include Antiphospholipid syndrome, Previous preeclampsia, Insulin-dependent diabetes, Multiple pregnancies, Null parity, Family history of preeclampsia, Age >40 years and Preexisting hypertension [8,9]. Recently the role of lipids in the pathogenesis of preeclampsia is considered [10-12]. Lipoprotein metabolism disorders are known as the main cause of endothelial damage that leads to hypertension [13] for example plasma high triglycerides could damage vascular function by prothrombotic activity [14]. We think that the possibility of anticipating preeclampsia could enable the physician to plan better management of this disease which still represents a major challenge in prenatal medicine. This study aimed to evaluate maternal and umbilical cord serum lipid profiles between healthy pregnant women and preeclamptic patients.

MATERIALS AND METHODS

A cross-sectional study was designed and 116 women with pregnancies between 38 and 41 weeks of gestation were investigated. The patient group consisted of 58 women with preeclampsia. The control group consisted of 58 pregnant healthy women. Preeclampsia was diagnosed by blood pressure more than 140/90 mmHg on 2 measurements by 6 hours interval and with proteinuria of 100 mg/dl by urine analysis or 300 mg in a 24-h urine collection after 20 weeks of gestation [15]. Inclusion criteria were women aged 18-35 years with pregnancies between 38 and 41 weeks of gestation and normal prepregnancy BMI without confounding factors like smoking, multiparity, use of alcohol, intensive work, PROM, diabetes mellitus, chronic hypertension, heart failure, inflammatory or infective disorders, renal disease, pregnant with donor eggs, history of previous preeclampsia in participants or first-degree relative females and women who in labor. All of the participants were being supplemented with multivitamins during pregnancy according to the doctor's advice. All women delivered *via* elective cesarean section. Maternal samples were obtained after 8 hours of fasting and exactly before going to the operating room. Umbilical cord blood was collected at the time of delivery. The samples were analyzed within four hours of collection, using the enzymatic method.

Statistical analyses

Independent samples T-tests were conducted to analyze differences in lipid profile levels between cases and controls using SPSS version 16. The results were expressed as the mean ± standard deviation. The value was assumed to be significant at a $p < 0.05$.

Ethical approval

Informed consent was obtained from the participants in the study, and ethical approval was granted by the Zanjan University of Medical Science Ethics Committee.

RESULTS

A total of 116 women enrolled in the study including 58 patients with preeclampsia as group 1 and 58 controls as group 2. The mean maternal age was 28.3 ± 5.5 and 26.8 ± 5.3 for group 1 and group 2 respectively 34.5 percent of group 1 and 53.4 percent of group 2 was primigravid that was a significant difference ($p = 0.04$).

According to birth sex, 62 % of group 1 was male while 55% of group 2 was male. The mean birth weight in case and control were 3190 ± 354.3 gr, 3236.3 ± 377.2 gr. In terms of maternal age, birth sex, and birth weight there were no significant differences between the two groups, while in terms of gravid, there were significant differences between two groups; 21% of healthy mothers and 34% of preeclamptic mothers was multigravida ($p = 0.01$) Maternal plasma lipid concentrations were measured and presented as mean ± SD in table 1.

According to table 2, all variables in healthy women were higher than preeclamptic women but there were no significant differences regarding plasma TG and HDL level between two groups, whereas serum total cholesterol and LDL was found to be significantly higher in healthy pregnant women ($p < 0.05$)

On the other hand in the umbilical cord blood samples exposed to preeclampsia, lipid levels were more than the control group except for HDL which was almost equal in the two groups, however, there was no statistically significant difference.

Table 1: Comparing mean ± SD of lipid profile in the maternal blood (mg/dl).

Variable	Preeclamptic	Healthy	*p* value
TG	188.5 ± 68.9	199.6 ± 64.2	0.26
TC	222.3 ± 48.5	253.8 ± 74.4	0.03
HDL	48.9 ± 16.7	49.3 ± 11.3	0.17
LDL	105.9 ± 34.5	129.4 ± 51.4	0.02

TG: Triglyceride; TC: Total Cholesterol; LDL: Low-Density Lipoprotein; HDL: High-Density Lipoprotein.

Table 2: Comparing mean ± SD of lipid profile in the cord blood samples (mg/dl).

Variable	Preeclamptic	Healthy	*p* value
TG	38.5 ± 24.8	34 ± 22.1	0.34
TC	84 ± 27	77.5 ± 26.7	0.19
HDL	27 ± 8.6	27.9 ± 11.2	0.78
LDL	26.1 ± 11.5	26.1 ± 11	0.91

TG: Triglyceride; TC: Total Cholesterol; LDL: Low-Density Lipoprotein; HDL: High-Density Lipoprotein.

DISCUSSION

In the present study, we evaluated lipid levels in cord and plasma of women with normal pregnancy and preeclampsia. The results of our study showed that serum total cholesterol and low-density lipoprotein cholesterol level was significantly different between the two groups. Also lipid level in the cord of preeclamptic mothers was higher than in the healthy group but this difference was not significant. These findings are consistent with results from some previous studies [16,17] Furthermore, lipid level in the multigravid group was lower than primigravid group but that was not significant**.** Our data showed that lipid values in pregnant women without preeclampsia were significantly lower than those found in pregnant women with preeclampsia.

Use of vitamin C and vitamin E can cause a reduction in lipid values, and some studies suggest that this may be one of the reasons for the lower lipid levels [18-20] observed during pregnancy in our study, however, we think vitamins could not explain these differences, since women with and without preeclampsia both take same vitamins. We tried to reduce confounding factor and select our participants carefully so by considering that diet and nutrition can affect lipid level [21,22]. We believe that such differences in lipid profile values in our research are more likely to be caused by other unexpected reasons like being more careful about nutrition and diet in preeclamptic mothers. On the other hand, many previous studies documented high lipid level in preeclamptic cases but unlike our study, almost any of them didn't exclude patients with risk factors from their study and as we know some of these risk factors for example prepregnancy BMI could be one of reasons of dyslipidemia in that studies [23,24] so we thought this difference between our results and their's could be a cause of unknown predisposing factors that were excluded in our study. Moreover in our study participation's delivery was done by elective cesarean and as some studies show elective cesarean delivery's stress is lower than vaginal delivery's and it could reduce lipid level especially in cord samples [25,26].

Our study did have a limitation. Firstly, it was a cross-sectional study and the association between lipid profile and the maternal and fetal adverse consequence could not be evaluated. Secondly, our sample of Iranian pregnant women may differ from other populations, although our results are in accordance with those of other studies done in different countries [27-29] third, this study was performed at a single center and uses a very small sample population. Selective bias may be unavoidable. The existence of maternal predisposing factors like diet seems to be necessary to find out why some preeclamptic women have dyslipidemia and why others have not.

CONCLUSION

Based on these results, we conclude that maternal lipid levels don't increase in preeclampsia always; this appears it depends on predisposing factors. Further molecular case-control studies are needed to evaluate the value of lipid level for the detection of preeclampsia.

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