Association of pre-eclampsia with dyslipideamia

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Abstract

Background and objective: Pre-eclampsia and eclampsia are claimed to be associated with disturbances in lipid profile. The purpose of this study was to determine any significant association between pre-eclampsia/eclampsia with lipid profile disturbances.

Methods: This prospective study evaluated lipid profile in the second half of pregnancy in 38 pre-eclamptic, 21 ecalmptic woman and compared to 41 age matched healthy pregnant women served as a control for the period of February 2010 – January 2011.

Results: Pre-eclamptic women showed a significant increase in the mean serum cholesterol concentration (243.9 mg/dL) during the second trimester when compared with the healthy pregnant controls (212.9 mg/dL), eclamptic women had even a significant higher cholesterol level at a mean of (288.1 mg/dL). Triglyceride level significantly increased in pre-eclamptic (281.7 mg/dL) and eclamptic women (307.4 mg/dL) compared to healthy pregnant control (207.5 mg/dL). LDL level also showed significant increase in pre-eclamtic {143.7 mg/dL} and eclamptic cases (156.5 mg/dL). HDL level though was decreased in pre-eclamptic {41.5 mg/dL} and eclamptic (40.8 mg/dL) but these changes were not significant.

Conclusion: Pre-eclampsia and eclampsia are associated with dyslipidemia. This association may be significant in understanding the pathologic processes of preeclampsia and may help in developing strategies for prevention or early diagnosis of the disorder.

Keywords: Pre-eclampsia, cholesterol, triglycerides, low density lipoprotein (LDL)

Introduction

Pre-eclampsia is one of the most common complications of pregnancy. The disorder complicates approximately 5 – 7% of pregnancies[1]. Preeclampsia is characterized by hypertension, proteinuria[2] with a substantial risks for both the fetus & the mother. The fetus is liable to develop intrauterine growth retardation, prematurity & death, where as the mother is at risk of seizures, renal failure, pulmonary edema, stroke, and death [3]. Pregnant ladies with family history of essential hypertension &/or hyperlipideamia have higher risk of developing pre-eclampsia & even eclampsia[3,4]. Women with a history of pre-eclampsia claimed to have significant differences in lipid profile and an increased susceptibility to lipoprotein oxidation when compared with women who had normal pregnancy[4,5]. In normal pregnant woman endothelial prostacycline reaches 8-10 times more than a non- pregnant woman, but in preeclamptic women this rising is only 1-2 times more, while thromboxane in preeclamptic women rises more than that in normal pregnant women[6]. Because prostocyclin is a vasodilator and thromboxane is vasoconstrictor, endothelial cell destruction causes rising in the thromboxane / prostacyclin rate which makes vasospasm, increasing lipid synthesis causes rising in the thromboxane/ prostacyclin rate and may be of importance in the pathogenesis of pregnancy induced hypertension[7], as a consequence, alteration of lipid metabolism may have some role in the development of pre-eclampsia. This study aimed to relate the alterations in lipid profile (Cholesterol, Triglycerides, LDL -cholesterol, HDL -cholesterol) with normal and pre-eclamptic /eclamptic women.

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Methods

A prospective study was done in maternity teaching hospital /Erbil city-Kurdistan region- north of Iraq, form February 2010 to January 2011. Included into the study: pregnant women aged 19-41 years in their second half of gestation, grouped as follows: 41 healthy pregnant women composed the (Group: 1), 38 cases with preeclampsia (Group: 2), diagnosed by the presence of persistent hypertension (> 140/90 mm Hg), proteinuria, pathological oedema and hyperuricemia, 21 cases with eclampsia (Group: 3) diagnosed by the additional of convulsion or coma. {Referring to the bulletin of American College of Obstetricians and Gynecologists[8]} In the second trimester of pregnancy, 12 hours fasting venous blood was sampled and serum was separated by low-speed centrifugation (3000 g for 15 min) then the serum was analyzed for lipid profile using BT 35i auto analyzer. Serum total cholesterol (TC), triglycerides (TG), and high density lipoprotien cholesterol (HDL) was measured by enzymatic methods. Serum low density lipoprotien cholesterol (LDL) was calculated by Frederickson-Friedwald's formula according to which: LDL cholesterol = Total cholesterol - (HDL cholesterol+ VLDL cholesterol). Pregnant women with history of chronic hypertension, diabetes mellitus, dyslipidemia, cardiac, renal, thyroid disease, or any other medical conditions were excluded from this study as those who are on medications apart from iron-folic acid supplements routinely given in pregnancies & antihypertensive drugs used in cases of pre-eclampsia. Informed consent was obtained from each patient.

Statistics

The values of laboratory parameters were presented as the Mean ± SD. A Student's unpaired t-test was used for cross sectional comparisons of continuous variables between the 3 groups, healthy pregnant women, pre-eclamptic & eclamptic women. The results were considered statistically significant when the probability of the null hypothesis was less than at least 5% ($p \leq 0.05$).

Results

There was statistically significant higher level of serum cholesterol in preeclampsia (243.9 (S.D. 18.2) mg/dL) and eclampsia (288.1 (S.D. 26.5) mg/dL) as compared with normal pregnant women (212.9 (S.D. 20.3) mg/dL). Serum triglyceride was also significantly higher in preeclamptic (281.7 (S.D. 21.3) mg/dL) & eclamptic (307.4 (S.D. 23.7) mg/dL) as compared with normal pregnant women (207.5 (S.D. 21.6) mg/dL) The same hold true for serum LDL as its level markedly increased in preeclamptic (143.7 (S.D. 17.1) mg/dL) & eclamptic (156.5 (S.D. 16.6) mg/dL) as compared with normal pregnant women (119.2 (S.D. 10.4) mg/dL). The HDL, though, was lower in preeclamptic (41.5 (S.D. 9.3) mg/dL) & eclamptic {40.8 (S.D. 8.9) mg/dL} as compared with normal pregnant women (42.1(S.D. 8.1) mg/dL) but these changes were not statistically significant. Comparing the preeclamptic & eclamptic groups, apart from total serum cholesterol, there were no statistical significant changes in lipid profile indices.

Table 1: Mean Lipid profile in normal pregnancy compared with preeclamptic/ eclamptic patients**.**

	Normal Pregnant G1=41	**Preeclampsia** G2=38	**Eclampsia** G3=21
Mean Cholesterol	212.9 (20.3)	243.9(18.2)*	288.1 (26.5) $^{\Omega\ \pi}$
Mean Triglyceride	207.5 (21.6)	281.7(21.3)*	307.4 (23.7) $^{\Omega}$
Mean LDL	119.2 (10.4)	143.7 (17.1)*	156.5 (16.6) $^{\Omega}$
Mean HDL	42.1(8.1)	41.5(9.3)	40.8(8.9)

* P< 0.05:G2 compared with G1, $^{\Omega}$ P < 0.05:G3 compared with G1, $^{\pi}$ P < 0.05:G3 compared with G2
LDL = Low density lipoprotein
HDL= High density lipoprotein

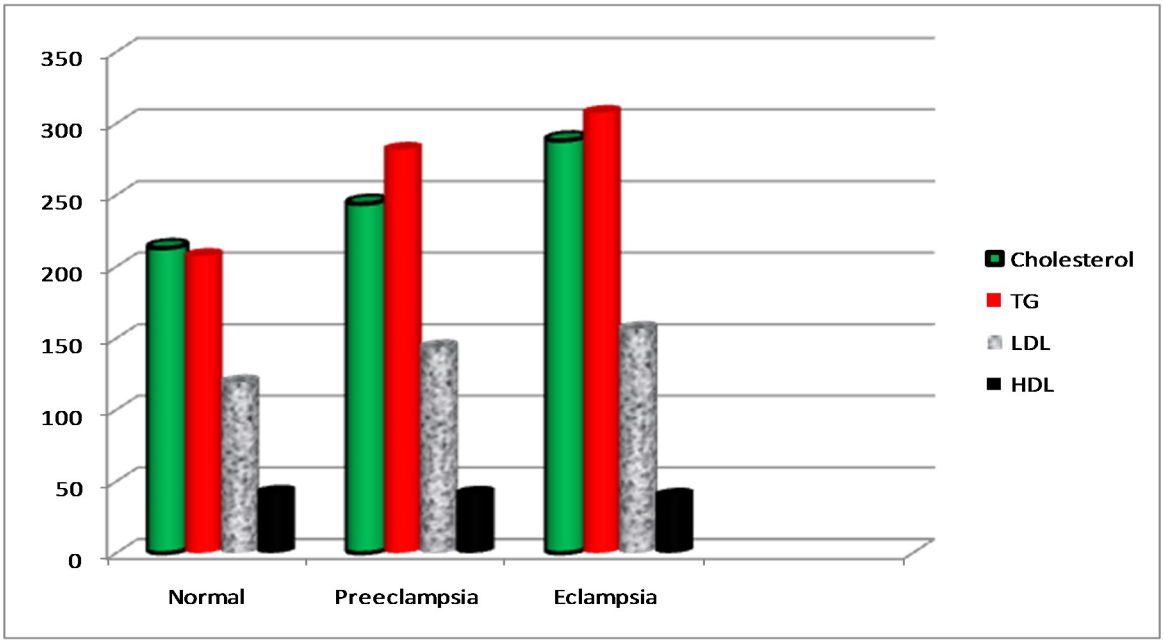

Figure 1: Lipid profile Values in mg/dL (standard deviation)

Discussion

This study was compatible with other studies that there were major disturbances in lipid profile in preeclamptic & eclamptic patient as compared with normal pregnancy [9-13]. However, there were variations in level of significance of various lipid indices alterations, for example, this study clearly showed significant increase in total serum cholesterol in our preeclamptic & eclamptic cases, this is consistant with Adegoke [14], but inconsistent with Jayanta De[15], this bias may be related to the number of patients in other study. Almost all studies[12-17] showed significant elevation in serum triglyceride; normal pregnancy is associated with hyperoestrogenaemia, however, hypertriglyceridemia in pre-eclampsia is probably not due to hyperoestrogenaemia as the level of oestrogen usually decreases in pre-clampsia. Some studies have concluded that hypertriglyceridemia may be due to hyperinsulinism found in pregnancy complicated by hypertension as there appears to be an exaggeration of insulin resistance and associated metabolic changes[14-17]. The increased triglyceride may be deposited in predisposed vessels, such as the uterine spiral arteries and contributes to the endothelial dysfunction, through generation of small dense LDL, moreover, this hypertriglyceridemia may be associated with hypercoagulability[18] these factors will mediate the resulting hypertension, preeclampsia & eclampsia. The same hold true for the observed significant high level of serum LDL accompanying the elevated serum triglyceride & its contribution to the pathogensis of preeclampsia & eclampsia[19].Dyslipidemia mediated activation of the endothelial cells to the placentally derived endothelial disturbing factors like lipid peroxides, trophoblastic components or combination of placentally derived factors with the lipoproteins are regarded as possible contributors for pathogenesis of PIH & pre-eclampsia[21], thus the assessment of these indices are helpful in evaluation & prevention of complications in pre-eclampsia & eclampsia. This study revealed no significant reduction of HDL in preeclamptic & eclampsia as compared with normal pregnancy, other studies[22-24] showed variables & inconsistent results

regarding this reduction, it seems that serum HDL alteration has no direct role in the pathogenesis of preeclampsia & eclampsia[25]. The Low level of HDL in pre-eclampsia may be related to hypooestrogenaemia & insulin resistance that can be encountered in such cases[26].

Conclusion

This study clearly showed that the women who develop pre-eclampsia & eclampsia had significant changes in lipid profile due to abnormal lipid metabolism. These findings may be relevant for understanding the aetiology & pathophysiology of pre-eclampsia and may help in developing strategies for prevention and early diagnosis of pre-eclampsia, it also raises a theory for the future treatment of pre-eclampsia by lipid lowering agents &/or lipoprotein apheresis.

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