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Short communication

Comparison of maternal and neonatal serum leptin levels in preeclampsia and normal pregnancy

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Abstract

Background: Leptin is a protein product of obesity gene and is synthesized mainly by adipose tissue.

Objective: The aim of this study was to determine maternal and neonatal serum leptin levels in term preeclamptic and normal pregnancies.

Materials and Methods: This cross sectional study was performed on 37 preeclamptic and 40 normotensive term pregnant women without other disease. Serum level of leptin was measured in all of pregnant mothers and after delivery, their neonates. This study was performed in Babol Yahyanejad Hospital from March 2006 to December 2006.

Results: Infants with preeclamptic mothers had significantly lower leptin level than control group (p=0.02). There was no significant difference in serum leptin levels between normal and preeclamptic women (p=0.749).

Conclusion: According to the results, it would be concluded that leptin level in infants of preeclamptic mothers is lower than infants of normal mothers. This can only confirm the diagnosis of disease after birth but it cannot predict the preeclampsia.

Key words: *Leptin, Newborn, Pre-eclampsia, Umbilical cord.*

Introduction

Leptin, a 16-KD polypeptide and the protein product of obesity gene, is synthesized mainly by adipose tissue (1, 2). Its level rises as body fat mass increases and contributes to energy homeostasis (2, 3). This 167-amino-acided protein is also present in ovaries, decidua and possibly contributes to the reproductive function (1, 2). Leptin may be detected in the umbilical cord from the 18th gestational week and its level increases up to term (2).

On the other hand, leptin levels are higher among women than men because women have a BMI (Body Mass Index) with relatively higher content of fat and serum leptin level is proportional to adiposity. Preeclampsia, a systemic disease characterized by hypertension and proteinuria after the 20th gestational week, is due to incomplete trophoblastic invasion (3, 4) and diffuse endothelial dysfunctions (5, 6). During early pregnancy, when cytotrophoblasts invade the endometrium, they produce leptin which is probably involved in cytotrophblastic invasion. As placenta produces leptin, its hypoxia, occurred in preeclampsia, is likely to enhance leptin production (1, 7). Yet still, results about leptin concentration in preeclamptic women and their infants are controversial (3, 7-12). Some studies have detected its increase in pre-eclamptic women (7, 8, 13-18). But in others, it is found to be unchanged (9, 19, 20). The aim of this study was to compare maternal and umbilical vein serum leptin level between normotensive pregnant

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women as control group and preeclamptic patients.

Materials and methods

In this cross-sectional study, we recruited a total number of 77 pregnant women (37 preeclamptic healthy women as group A and 40 normotensive healthy women as control group (group B) from Babol Yahyanejad Hospital from March to December 2006. This sample size can detect on average difference of 2ng/ml on leptin level in maternal serum and umbilical cord serum, with 95% confidence level and 80% power of statistical test. Two groups under study were matched with respect to maternal age and gestational age. Preeclampsia was diagnosed by hypertension (BP≥140/90 mmHg) and a 24-hour urine protein ≥300mg or a2+ protein in a random urine specimen using dipstick.

The exclusion criteria were; women with preterm labor and patients with other systemic diseases such as diabetes and chronic hypertension. There was no history of systemic disease in the healthy pregnant control group. Venous blood samples were taken from each woman immediately before delivery. All patients were fasting for 6-8 hours prior to delivery.

A 10cm segment of cord was double-clamped after delivery and blood sample was taken from umbilical vein. Then serum was separated and serum leptin level was measured. We used human leptin assay kit (L-IBL Code no. 27127) Elisa method and the minimal detectable concentration of leptin by this assay was 0.19mg/ml. In addition other data including mother and neonatal weights were recorded in a questionnaire.

Statistical analysis

Data was analyzed by SPSS software, Fisher's exact and t-test. P-value of less than 0.05 was considered significant. The ethics committee of Babol University approved the study and all cases gave informed consent. In statistical analysis, we used regression model in order to adjust the effect of maternal weight on maternal and umbilical cord leptin difference between case and control.

Results

The average (±SD) age of the patients was 28± 4.0 and 27±4.2 years in group A and B, respectively. The average (±SD) gestational age was 38±1.5 and 39±1.5 weeks in group A and group B, respectively. There were no significant differences regarding maternal age, gestational age and birth weight between group A and B, whereas mothers' weight (before delivery) was found to be significantly higher in group A (p=0.006) (Table I). Also maternal serum leptin levels were not significantly different in two groups but there was significant lower umbilical cord leptin concentration in neonates delivered from preeclamptic women (p=0.018) (Table II). Table III shows the unadjusted and adjusted regression coefficient for difference in mean of maternal leptin serum level and umbilical cord serum level between case and control. Unadjusted regression coefficient of umbilical cord was significant while after adjusting for maternal weight, the magnitude of coefficient slightly reduced but it did not reach to significant level.

Table I. The mean (± SD) age and clinical characteristics of the preeclamptic and normal pregnant women.

	*Group A (n=37) (Mean± SD)	°Group B (n=40) (Mea(± SD)	p-value
Age (years)	28±4.0	27±4.2	0.70
Mothers weight (kg)	82 ± 16.4	72.7 ± 12.3	0.006
Birth weight (kg)	3.31 ± 0.59	3.21 ± 0.51	0.61

***Group A:** Preeclamptic women **°Group B:** Control women

Table II: The mean (± S.D) maternal and umbilical cord serum leptin levels in group A and B.

	*Group A (n=37)	°Group B (n=40)	p-value
Maternal serum Leptin (ng/ml)	5.3 ± 5.1	4.9 ± 4.4	0.74
Umblical cord serum leptin (ng/ml)	2.8 ± 2.9	4.4 ± 4	0.043

*** Group A:** Preeclamptic women **°Group B:** Control women

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Table III. Unadjusted and adjusted mean difference of maternal and umbilical cord leptin using regression model.

Dependent variable	Unadjusted coefficient mean difference ± SE	p-value	Adjusted * coefficient mean difference ± SE	p-value
Maternal leptin (ng/ml)	0.35±1.09	0.75	-0.31±1.13	0.78
Umbilical cord leptin (ng/ml)	-1.7 (±0.81)	0.04	-1.5±0.85	0.07

* The effect of maternal weight as covariate was adjusted using regression model.
Mean difference±SE= Mean case – mean control ± Standard error.

Discussion

In this study, the cases and controls in two groups were almost similar in gestational and maternal age, but mother's weight in group A was significantly higher than that in control group, which is acceptable due to the edema in pre-eclamptic women. On the other hand, even though the preeclamptic group had higher serum leptin concentrations, no significant difference was found in maternal serum leptin levels between group A and B. Similarly, Salomon *et al* has reported leptin concentrations in preeclamptic and control group (19) to have no significant difference with each other and also Martinez-Abundis *et al* reported the serum leptin concentration to be equal in preeclamptic and normotensive pregnant women (20), but many other authors such as Vitoratos *et al* suggested significant higher leptin concentrations in preeclamptic women (21, 22).

In the study by Vitoratos, evaluation of mother's serum leptin was at early third trimester whereas in the current study, this evaluation was at term pregnancy and before delivery. This fact can probably explain the different results. In our study, although there was a significant lower umbilical cord leptin concentration in the neonates of preeclamptic group compared to those in normotensive group, but in regression model we did not find any significant difference between two groups (Table III). Mc Carthy *et al* suggested that cord leptin level was not significantly different between preeclampsia and normal pregnancy (14), but Ronnaug *et al* reported that cord plasma leptin concentrations in neonates of preeclamptic group was higher (4).

Many studies reported that placenta has an effect on the elevation of leptin concentration in maternal serum and fetal circulation during pregnancy (23, 24) and Mise *et al* has suggested that placental leptin production is increased in cases of severe preeclampsia (25), therefore leptin secreted from placenta may be involved in the pathogenesis of preeclampsia. While in this study, no significant difference was found between the serum leptin concentrations in preeclamptic and normotensive groups, which may be due to the presence of several mild preeclamptic women in our patients group. Since lower serum leptin concentrations were detected in neonates of pre-eclamptic group, more extensive studies should be designed to determine the role of leptin in preeclampsia.

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