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Association of Serum Leptin with Dyslipidemia in Patients with Preeclampsia

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KEYWORDS:

Leptin, Blood Pressure, Dyslipidemia and Preeclampsia

ABSTRACT:

Introduction: Leptin is a protein generated from adipose tissue and involved in metabolism. Leptin has recently been linked to preeclampsia, in addition to other indicators for the diagnosis. This study's aims to evaluate the serum leptin levels with blood sugars and dyslipidemia in preeclamptic women and controls.

Objectives: This study's aims to evaluate the serum leptin levels with blood sugars and dyslipidemia in preeclamptic women and controls.

Methods: A cross-sectional study was conducted in the Department of Obstetrics and Gynecology. A total of 120 pregnant women with and without preeclampsia were included in the study group. Serum leptin was estimated by leptin ELISA kit.

Results: The preeclampsia groups had higher levels of leptin than the control groups and these levels were significantly associated with BMI, blood pressure and dyslipidemia (P = 0.001**).

Conclusions: This study concludes the association of high serum leptin levels with preeclampsia and determination of serum leptin can be used as a diagnostic marker in preeclampsia in addition to other conventional biomarkers.

1. Introduction

The hormone leptin is crucial for a number of physiological functions, such as the control of immunological response, angiogenesis, inflammation, endocrine function, and reproduction (1). Although the placenta also produces leptin during pregnancy, adipose tissue is the primary source of leptin. Compared to non-pregnant women, placental leptin expression is elevated during a typical pregnancy and is thought to enhance implantation, the synthesis of human chorionic gonadotrophin, placental expansion, amino acid absorption, and mitogenesis (2-3). Therefore, a dysregulation of leptin levels could be a sign of or cause maternal illness. For instance, preeclampsia, a systemic maternal illness marked by the onset of hypertension and proteinuria after 20 weeks of gestation, is associated with increased placental leptin expression and circulating leptin levels (4-5).

The widely recognized theory that placental failure causes an increase in placental-associated variables, which in turn causes maternal systemic illness, is compatible with elevated placental leptin expression in preeclampsia (6-7). One theory is that placental stress causes an increase in leptin to improve the fetus's nutritional delivery. On the other hand, preeclamptic women's increased leptin expression is mediated by a combination of placental factors and high maternal inflammation. Increased placental leptin may be a useful indicator of illness in both situations (8-9). Furthermore, there is evidence that leptin may directly contribute to the pathophysiology of preeclampsia. It has been demonstrated that elevated leptin raises blood pressure

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by activating the sympathetic nervous system and producing nitric oxide (10-11). Additionally, leptin may have pro-inflammatory qualities, and preeclampsia is linked to inflammation. Some of the studies reported leptin and preeclampsia have been reported to be significantly correlated (12-13). However, some studies have found no correlation after controlling for maternal factors. Hence, present study aims to evaluate the correlation of serum leptin with dyslipidaemia in preeclampsia.

2. Objectives

This study's aims to evaluate the serum leptin levels with blood sugars and dyslipidemia in preeclamptic women and controls.

3. Methods

This cross-sectional study consisted of 60 patients who were diagnosed with preeclampsia outpatient OPD, department of obstetrics and gynaecology, Akash Institute of Medical Sciences and Research Centre, Bangalore. Additionally, the control group consisted of 30 normal pregnant women. The preeclampsia was further sub grouped into 2 groups, 30 mild preeclampsia and 30 severe preeclampsia. The study was approved by the Institutional Ethics Committee, AIMSRC, Bangalore was obtained and informed consent was taken from the participants before the study.

The study subjects age between 18 and 35 years pregnant women were diagnosed with PE according to the American College of Obstetricians and Gynecologists criteria (14) and normal pregnant women without any illness were included. Subjects have multiple pregnancies, chronic hypertension, diabetes, thyroid disorders, and other systemic diseases were excluded from the study. Fasting overnight venous blood samples were collected for clinical and leptin measurements. Demographic data, obstetric history, and clinical measurements were collected from all participants. Blood pressure was measured using standardized techniques. Serum leptin levels were measured using the enzyme linked immunosorbent assay method.

Statistical methods

The data were represented as mean and standard deviation. Comparison between the variables was done by using analysis of variance and correlation between the variables done by using pearson's correlation analysis. The comparison between study subjects done by box plots. The P value less than 0.05 was taken significant. The data entry and analysis were performed using SPSS version 21.0.

4. Results

Table 1: Comparison of study variables between study subjects

Table 1 illustrates the comparison of study variables between study subjects. The age, weeks of gestation, BMI significantly increased in both groups of preeclampsia when compared to controls (P=0.001**). There was a significant increased level of SBP, DBP, total cholesterol, triglycerides, VLDL and LDL and decreased HDL in both groups of preeclampsia when compared to controls (P=0.001**). The serum leptin significantly enhanced significantly in both groups of preeclampsia when compared to controls (P=0.001**).

Table 2: Correlation of serum leptin with other parameters of study

Table 2 demonstrates the correlation of study variables between study subjects. There was significant positive correlation between serum leptin and BMI like SBP, DBP, total cholesterol, triglycerides, VLDL, LDL and significant negative correlation HDL (P=0.001**).

5. Discussion

In the present study the mean BMI of cases and controls and when correlation was done, significant positive correlation was observed between serum leptin and BMI in preeclampsia (P=0.001). The mean systolic and diastolic blood pressure in their study among the cases were compared with serum leptin levels, it was found to be positively correlated. Similarly, previous studies also found serum leptin levels in preeclampsia (P=0.001) were independently related to maternal body mass index (BMI) and dyslipidemia (15-16). However, it might be appreciated that weight gain during pregnancy is solely not due to fat deposition.

Since adipose tissue is a source of leptin, it has been proposed in multiple studies that BMI is the cause of the rise in maternal leptin levels in preeclamptic women. However, because the fetus, placenta, amniotic fluid, increased plasma volume, and available degree of extravascular fluid storage all increase maternal weight during pregnancy, the body mass index does not adequately indicate fat accumulation (17-18).

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Additionally, they clarified that high plasma leptin levels in pre-eclampsia may be caused by hypoxia, which is implicated in the control of leptin expression. Leptin production is increased in preeclampsia due to elevated pro-inflammatory activity. Proinflammatory cytokines, such as interleukin-1 and interleukin-6, are involved in the pathophysiology of preeclampsia and have been shown to stimulate leptin production (19-20).

Maternal plasma leptin concentrations are higher during pregnancy and do not exhibit the known association with body fat energy storage seen in non-pregnant women, suggesting that leptin serves a different purpose during pregnancy and fetal development (21-22). Pathological diseases such gestational diabetes, pre-eclampsia, and intrauterine growth retardation produce dysregulation of maternal and fetal plasma leptin levels, which can either cause or result in disruptions in the feto-placenta-maternal unit (23-24).

Leptin plays a part in oxidative stress, which is characterized by elevated reactive oxygen molecules and may contribute to the etiopathogenesis of preeclampsia. Reactive oxygen molecules are found on numerous cells and are activated by leptin (25). Through vascular inflammation brought on by the buildup of reactive oxygen molecules in endothelial cells, leptin has been shown to be a risk factor for numerous problems, including hypertension and atherosclerosis (26). An essential physiological regulator of fetal growth, leptin is changed in pathological pregnancy conditions such diabetes and preeclampsia. Significant changes in the exchange of leptin between the mother, placenta, and fetus may alter the fetus's development and raise the risk of adult illness.

6. Conclusion

Based on result of this study has shown that serum leptin level is increased in all the preeclampsia cases than controls. The determination of serum leptin could effectively help in diagnosis, prognosis and effective treatment for preeclampsia.

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Table 1: Comparison of study variables between study subjects

Parameters	Controls	Mild Preeclampsia	Severe Preeclampsia	P-value
	Mean ± SD	Mean ± SD	Mean ± SD	
Age (Years)	28.33 ± 1.79	26.48 ± 2.17	26.38 ± 2.16	0.001**
Weeks of Gestation	26.52 ± 2.00	27.33 ± 1.40	32.25 ± 1.81	0.001**

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BMI (kg/m^2)	22.27	±	1.79	24.12	±	2.41	33.55	±	3.66	0.001**
SBP (mmHg)	128.18	±	37.58	166.28	±	51.78	184.47	±	15.11	0.001**
DBP (mmHg)	79.88	±	49.13	108.35	±	57.12	125.47	±	28.21	0.001**
HbA1C (%)	4.33	±	0.76	6.53	±	0.81	8.03	±	1.24	0.001**
Total Cholesterol (mg/dL)	161.	±	14.	173.	±	10.	276.	±	18.	0.001**
Triacylglycerides (mg/dL)	119.22	±	16.12	133.80	±	17.82	201.15	±	20.72	0.001**
HDL (mg/dL)	46.37	±	6.07	36.70	±	4.48	29.23	±	2.62	0.001**
VLDL (mg/dL)	23.09	±	3.41	26.84	±	3.70	41.69	±	4.06	0.001**

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LDL (mg/dL)	90.10	±	8.84	110.10	±	11.58	206.31	±	16.84	0.001**
Leptin (ng/mL)	17.25	±	2.56	29.57	±	4.30	45.88	±	3.23	0.001**

Triacylglycerides (mg/dL)	0.823	0.001**
HDL (mg/dL)	-0.816	0.001**
VLDL (mg/dL)	0.832	0.001**
LDL (mg/dL)	0.898	0.001**

Table 2: Correlation of serum leptin with other parameters of study

Parameters	**Serum Leptin (ng/mL)**	
	r- Value	**P-Value**
BMI (kg/m^2)	0.792	0.001**
SBP (mmHg)	0.834	0.001**
DBP (mmHg)	0.077	0.001**
HbA1C (%)	0.784	0.001**
Total Cholesterol (mg/dL)	0.863	0.001**