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Original Research Article

Correlation of adiponectin and leptin with BMI, blood pressure in patients with preeclampsia

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ABSTRACT

Background: The purpose of our research was to find out how serum levels of leptin and adiponectin are connected with preeclampsia and whether they may be used as biomarkers for the illness.**Materials and Methods:** Thirty (30) normal-pregnant patients and sixty (60) preeclamptic patients were included. Additionally, we included thirty (30) age- and BMI-matched healthy controls. Using an enzyme-linked immunosorbent assay, the amounts of leptin and adiponectin in the serum were measured.**Results:** When compared to healthy controls and normal pregnant women, patients with mild and severe preeclampsia had significantly higher blood pressure, body mass index, serum adiponectin, and leptin levels. According to the individual's correlation analysis, blood pressure and body mass index were positively and statically linked with serum levels of adiponectin and leptin.**Conclusion:** The study's conclusions suggest that the markedly elevated serum levels of leptin and adiponectin could serve as an indicator of preeclampsia.This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.For reprints contact: reprint@ipinnovative.com

1. Introduction

Pregnancy-related hypertension puts the health of the fetus and mother in grave danger. Preeclampsia, which affects between 2 and 15% of pregnancies globally, is a highly prevalent illness during pregnancy that is also linked to one of the most often reported prenatal issues.¹ It is defined as a gestational condition with signs of end organ damage such as pulmonary edema, abnormal liver function, renal impairment, cerebral and visual disturbance, and coexisting generalized edema or proteinuria, as well as a hypertensive disorder diagnosed after 20 weeks of gestation. In certain situations, there may be multiorgan involvement.² Impaired uteroplacental perfusion may also contribute to intrauterine fetal growth limitation and preterm delivery, among other issues during pregnancy. When things go

worse, the mother's and the fetus' lives could be in danger since the rate of death and morbidity would rise.^{3,4}

Recent research studies have also been demonstrated that these adipokines are involved in both normal and aberrant pregnancy. Adipokine dysregulation is hypothesized to exist in PE and to possess importance for the pathophysiology and prognosis of this disease.⁵ It has been demonstrated that the plasma protein adiponectin, which is generated by adipocytes, contributes to the regulation of insulin resistance and glucose homeostasis.⁶ Experimental and clinical research has linked low plasma levels of adiponectin to metabolic and vascular issues related to obesity, both of which are risk factors for pre-eclampsia. Due to their involvement in the regulation of blood pressure, IR, inflammation, angiogenesis, and endothelial cells, they are involved in the development of PE.⁷ Some of the studies are reported significant decreased levels of adiponectin in PE and several studies have revealed a notable rise in

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adiponectin in patients with PE.^{8,9}

Leptin is also one of the adipocytokine produced from adipose tissue and this is involved in numerous physiological processes, such as the control of immune response, inflammation, angiogenesis, reproduction, and endocrine function.¹⁰ Although adipose tissue is the primary source of leptin, the placenta also produces leptin during pregnancy. When compared to women who are not pregnant, placental leptin expression is higher during a typical pregnancy. This is thought to facilitate implantation, the generation of human chorionic gonadotrophin, placental growth, amino acid intake, and mitogenesis.^{11,12} Some of the studies are reported significantly elevated levels of leptin play a good role in patients with PE.^{13,14}

Variations in the adiponectin-leptin (A/L) ratio have also been assessed in relation to PE diagnosis and prognosis.^{15,16} Maternal levels of these adipokines may vary between pregnancies that are normal and pregnancies that are complicated by PE, assuming they play such a role. As a result, they might serve as emerging biomarkers and be essential for the diagnosis, prognosis, and development of therapeutic approaches for the treatment of PE. Hence, the current investigation sought to determine how BMI and blood pressure in preeclamptic patients were correlated with adiponectin and leptin.

2. Materials and Methods

A total sixty (60) patients diagnosed with preeclampsia as per Royal College of Obstetricians and Gynecologists (RCOG) who work in the obstetrics and gynecology department's outpatient department (OPD) at the Haveri Institute of Medical Sciences in Haveri, Karnataka. Based on their blood pressure, the preeclampsia patients were divided into two groups: Mild The definition of preeclampsia is blood pressure within the range of systolic >140 mmHg and diastolic is >90 mmHg (n=30, Group 3) and Severe Preeclampsia is diagnosed by systolic >170 mmHg and diastolic is >110 mmHg (n=30, Group 4). Additionally, we included thirty (n=30, Group 2) normal pregnant women and another thirty (n=30, Group 1) age and Body Mass Index (BMI) matched healthy volunteers recruited as controls. All the subjects were recruited in the study after an informed consent. The study was approved by Institutional Ethics Committee (IEC).

Four (4) ml of overnight fasting venous blood was collected into plain vacutainers were allowed to clot and separated by the process of centrifugation at 3000 rpm for 10 mins. The separated serum samples were transferred into appropriately labeled aliquots and stored at -50⁰ c until analysis was done. The adiponectin and leptin concentrations was analyzed by using Enzyme Linked Immunosorbent Assay (ELISA).

2.1. Statistical analysis

The data was checked for normality of distribution using kolmogorov Smirnov test and expressed as mean \pm standard deviation (SD). The difference in the adiponectin and leptin levels between patients, normal pregnant and controls was assessed using analysis of variance (ANOVA). The correlation between the variables was studied using pearson correlation analysis and the scatter plots was constructed between the variables. The SPSS for Windows version 20.0 and Microsoft Excel spreadsheets were used to conduct the statistical analysis. P values less than 0.05 were regarded as statistically significant.

3. Results

Table 1 illustrates comparison of study variables between the cases and controls. The age and BMI showed statistically significant between the cases and controls. The systolic and diastolic blood pressure significantly elevated in patients with preeclampsia than in controls. In cases when compared to controls. Furthermore, compared to controls, individuals with preeclampsia had considerably higher serum levels of leptin and adiponectin, respectively P values are less than 0.001**.

Table 2 illustrates comparison of study variables between the study groups. The age and BMI showed statistically significant between the groups. When compared to normal pregnant women and controls, patients with mild and severe preeclampsia had considerably higher systolic and diastolic blood pressure. Furthermore, compared to controls, patients with mild, moderate, and severe preeclampsia as well as normal pregnant women had significantly higher serum levels of adiponectin and leptin, respectively. P values are less than 0.001**.

Table 3 illustrates comparison of study variables between the study groups. The post hoc analysis showed there is a statistically significant BMI in between the study groups. The systolic and diastolic blood pressure showed significant in all the groups except group 3 and group 3. Additionally, the serum adiponectin and leptin levels also shown statistically significant in between the groups, respectively P values are less than 0.001**.

Table 4 illustrates the correlation analysis in between study variables. The adiponectin and leptin was positively correlated with other study variables respectively the P value is (0.001**).

4. Discussion

According to our findings, eclamptic pregnant women had significantly higher blood adiponectin levels than normal pregnant women with comparable gestational ages and body mass indices. In cases of severe pre-eclampsia, the shift was more noticeable than in cases of moderate pre-eclampsia.¹⁷ It has been suggested that elevated in pre-

Table 1: Comparison of study variables between cases and controls

| Parameter | Cases | | | | Controls | | | | P- Values |
|-------------------|--------|---|-------|--------|----------|------|---------|--|-----------|
| Age | 29.10 | ± | 3.35 | 25.13 | ± | 2.60 | 0.001** | | |
| BMI | 30.51 | ± | 6.89 | 24.16 | ± | 1.53 | 0.001** | | |
| SBP | 155.13 | ± | 27.87 | 127.60 | ± | 2.66 | 0.001** | | |
| DBP | 94.27 | ± | 14.55 | 77.17 | ± | 2.21 | 0.001** | | |
| Serum Adiponectin | 25.51 | ± | 10.56 | 4.71 | ± | 0.78 | 0.001** | | |
| Serum Leptin | 27.31 | ± | 11.84 | 7.63 | ± | 2.20 | 0.001** | | |

Table 2: Comparison of study variables between study groups

| Parameter | Group 1 | | Group 2 | | Group 3 | | Group 4 | | P- Values |
|-------------------|---------|--------|---------|--------|---------|---------|---------|--------|-----------|
| Age | 25.13 | ± 2.60 | 25.77 | ± 2.46 | 30.50 | ± 2.58 | 31.03 | ± 2.09 | 0.001** |
| BMI | 24.16 | ± 1.53 | 21.34 | ± 1.29 | 35.01 | ± 2.34 | 35.16 | ± 2.82 | 0.001** |
| SBP | 127.60 | ± 2.66 | 122.80 | ± 5.78 | 171.33 | ± 26.47 | 171.27 | ± 5.31 | 0.001** |
| DBP | 77.17 | ± 2.21 | 75.50 | ± 3.15 | 105.50 | ± 6.16 | 101.80 | ± 6.95 | 0.001** |
| Serum Adiponectin | 4.71 | ± 0.78 | 11.17 | ± 1.44 | 31.00 | ± 2.52 | 34.37 | ± 2.93 | 0.001** |
| Serum Leptin | 7.63 | ± 2.20 | 11.73 | ± 3.86 | 31.93 | ± 3.95 | 36.04 | ± 2.41 | 0.001** |

Table 3: Comparison of study variables between the groups by post hoc analysis

| Parameters | Group 1Vs Group 2 | Group 1vs Group 3 | Group 1vs Group 4 | Group 2vs Group 3 | Group 2vs Group 4 | Group 3vs Group 4 |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| BMI | 0.001** | 0.001** | 0.001** | 0.001** | 0.001** | 1.000 |
| SBP | 0.001** | 0.001** | 0.001** | 0.001** | 0.001** | 1.000 |
| DBP | 0.001** | 0.001** | 0.001** | 0.001** | 0.001** | 0.183 |
| Serum Adiponectin | 0.001** | 0.001** | 0.001** | 0.001** | 0.001** | 0.001** |
| Serum Leptin | 0.001** | 0.001** | 0.001** | 0.001** | 0.001** | 0.001** |

Table 4: Correlation of study variables in between the groups

| Parameter | Adiponectin | | Leptin | |
|-------------------|-------------|---------|--------|---------|
| | r | P | r | P |
| Age | 0.731 | 0.001** | 0.706 | 0.001** |
| BMI | 0.876 | 0.001** | 0.888 | 0.001** |
| SBP | 0.823 | 0.001** | 0.808 | 0.001** |
| DBP | 0.882 | 0.001** | 0.869 | 0.001** |
| Serum Adiponectin | - | - | 0.952 | 0.001** |
| Serum Leptin | 0.952 | 0.001** | - | - |

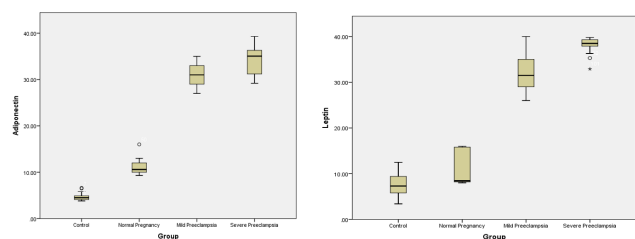


Figure 1: Comparison of serum adiponectin and leptin between the study groups

eclamptic women of normal weight, adiponectin levels

may represent a normal physiological feedback response. However, this process might not work as planned in pre-eclamptic women due to high adiponectin levels and insulin resistance.^{18,19} It is evident that the pathophysiology of pre-eclampsia may be greatly influenced by the paradoxical elevation of serum levels of these proteins when looking at both the clinical features of pre-eclampsia and the changes in adiponectin levels.²⁰ Since adiponectin suppresses the synthesis of angiotensin II, adiponectinemia is likely a protective feedback mechanism that lowers the synthesis of angiotensin II and lowers blood pressure. Additionally, because of its anti-inflammatory properties, adiponectin may aid in the restoration of the endothelium’s integrity in PE.²¹

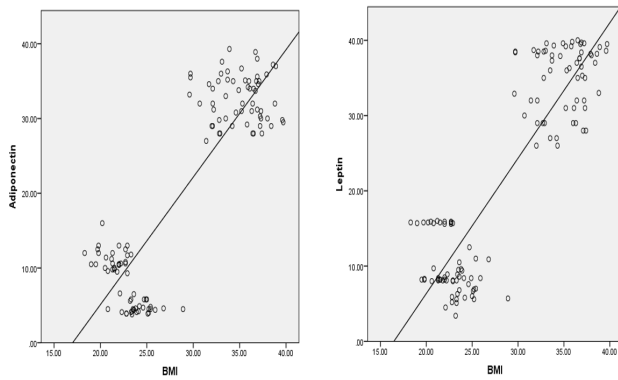


Figure 2: Scatter plots between adiponectin, leptin and BMI

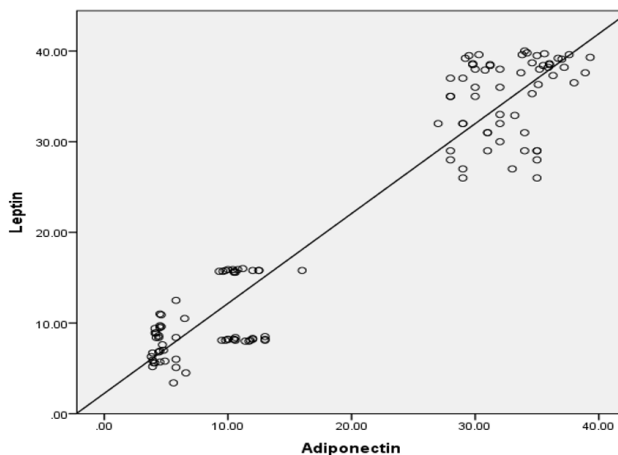


Figure 3: Scatter plots between adiponectin and leptin

Depending on the degree of preeclampsia, the severe group's serum leptin levels were higher than those of the mild group for comparisons, indicating a potential role for leptin in the pathophysiology of preeclampsia.²² Consequently, increased leptin levels have the ability to influence prognosis and serve as a gauge for the severity of preeclampsia.²³ Since there were some moderately preeclamptic women in that patient's cluster, the serum leptin level found in all expecting moms explained why there was no significant difference in the levels of normal and preeclamptic women.²⁴ In this study, the PE groups' maternal serum leptin levels were considerably higher ($P < 0.001$) than those of the control group. Serum leptin levels were found to be statistically significantly higher ($P < 0.001$) in the severe group compared to the mild group based on the severity of PE. The leptin levels in the PE group were significantly greater than those in the normal group. However, because the mother's weight is raised by the fetus, the placenta, the amniotic fluid, increased plasma volume, and the accessible degree of extravascular fluid storage, the BMI is not a good indicator of fat accumulation during pregnancy.²⁵

Furthermore, we found a strong positive connection between serum BMI, leptin, and adiponectin. It clearly indicates increased obesity lead to preeclampsia and in this condition significant elevation of adipokines like adiponectin and leptin beneficial for the patient with preeclampsia when compared to healthy controls. Hence, the substantial levels of serum leptin and adiponectin may be employed as a marker for preeclampsia based on the results of the current investigation.

5. Conclusion

The study's conclusions suggest that the markedly elevated serum levels of leptin and adiponectin could serve as an indicator of preeclampsia.

6. Sources of Funding

None.

7. Conflict of Interest

None.

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