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ASSOCIATION OF LIPID PROFILE IN THE DEVELOPMENT OF PREECLAMPSIA

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ABSTRACT

Background: Preeclampsia is a major medical complication of pregnancy and results in both maternal and perinatal morbidity and mortality. **Objective:** To find the association of Lipid profile in the development of Preeclampsia. **Methods:** A Cross-sectional study was done in the Department of Biochemistry, Andhra Medical College & King George Hospital, Visakhapatnam, with approval from the Institutional Ethics Committee. This study was conducted from February 2021 to October 2021. **Results:** The Mean \pm SD Age in controls is 23.72 ± 2.58 in years, in N-Preeclampsia is 24.48 ± 3.37 in years and in severe preeclampsia is 24 years. Age between the study groups is statically not significant. Period of gestation between the study groups is statically not significant. There is a high statistical significance in the systolic BP and diastolic BP between the study groups. There is a high statistical significance in the Serum Total Cholesterol levels, Serum HDL- Cholesterol levels, Serum LDL- Cholesterol levels and Serum VLDL-Cholesterol levels between the study groups.

Conclusions: The study showed highly significant association between lipid profile and preeclampsia, in which total cholesterol, triglycerides, LDL, VLDL showed positive correlation and HDL showed negative correlation with severity of preeclampsia

Keywords: lipid profile, preeclampsia, total cholesterol, triglycerides, LDL, VLDL

INTRODUCTION

Preeclampsia is a multisystem disorder with a prevalence of 7 - 10% in India. It is defined as the development of Hypertension with systolic blood pressure ≥ 140 mmHg and diastolic blood pressure ≥ 90 mmHg along with proteinuria (≥ 300 mg/day) after 20 weeks of Pregnancy in a previously normotensive and non-proteinuric woman.

The etiology and pathogenesis of Preeclampsia are still unclear despite considerable research but endothelial dysfunction and abnormal placentation are considered to be the key factors in the Pathogenesis of Preeclampsia. Multiple factors may provoke endothelial changes. It is considered that an abnormality in the lipid profile is not merely a manifestation of Preeclampsia but has a direct effect on endothelial dysfunction¹ Lipid-mediated oxidative stress could be the cause of endothelial dysfunction. Malondialdehyde (MDA) is a product of lipid peroxidation. It is used as a marker of oxidative stress and previous studies reported that MDA levels were increased in Preeclampsia².

Usually, there is only a slight change in the levels of hepatic enzymes like ALT, AST, ALP during pregnancy. But abnormalities in the hepatic enzymes occur in about 20-30% of pregnancies and may present as an initial sign of pathological conditions, of which the most frequent cause is Preeclampsia. HELLP syndrome is a variant of severe preeclampsia, characterized by Hemolysis (H), elevated liver function tests (EL) and low platelet count (LP). Liver involvement in preeclampsia is an indicator to prevent more serious complications like edampsia, hepatic rupture and necrosis.

Uric acid is the and product of purine metabolism and is a marker of oxidative stress. Decreased renal excretion, tissue ischemia, oxidative stress and increased activity of xanthine oxidase results in increased production of Uric acid. Hyperuricemia mpairment in nitric oxide generation and results in endothelial dysfunction² promoting hypertension, vascular disease and renal disease. The present study is aimed at evaluating the above said parameters as biochemical markers for early prediction and prevention of presdempsia.

MATERIALS AND METHODS

A Cross-sectional study was done in the Department of Biochemistry, Andhra Medical College & King George Hospital, Visakhapatnam, with approval from the Institutional Ethics Committee. This study was conducted from February 2021 to October 2021.

A total of 162 patients between the age group 18 - 35 years, who were attending the OPD or admitted to the Department of Obstetrics, King George Hospital, Visakhapatnam were selected for the study. All the subjects were divided into three groups, fulfilling the inclusion and exclusion criteria.

Group A - 54 normotensive pregnant women.

Group 8-56 pregnant women with Mild (NON-SEVERE) Preeclampsia.

Group C-54 pregnant women with Savers Preeclampsia.

Sample size: Sample size was calculated by taking effect size (d) ss 0.5.

INCLUSION CRITERIA:

- a) Pregnant women with 20 weeks of gestation and are willing to participate in the study.
- b) Age group 18-35 years
- c) Primi or multigravide.
- d) Pregnant women with a singleton pregnancy.
- e) Pregnant women with hypertension -
 - i. Non severe (mild) Preeclampsia-SBP \geq 140mmhg and DBP \geq 90mmhg
 - ii. Severe Preeclampsia- systolic blood pressure \geq 160mmHg and diastolic blood pressure \geq 110mmHg
- (f) Normotensive pregnant woman.

EXCLUSION CRITERIA:

- a. Pregnant woman who are not willing to participate in the study.
- b. Patients with known Cardiac disease. Renal disease, Diabetes. Dyslipidemia, Alcoholism, Liver disease, Gout, RH negative blood group.
- c. Pre-existing hypertension or on any type of antihypertensive drugs.
- d. Multiple pregnancies.

The study was done according to the following steps:

1. The study protocol was approved by the INSTITUTIONAL ETHICS COMMITTEE, Andhra Medical College.
2. Informed consent was taken from each participant after explaining the purpose of the study before their recruitment.
3. History was taken from each participant to ascertain the fulfillment of the selection criteria.
4. A thorough clinical examination was done on each participant.
5. The blood pressure was measured by making the participant lie on the couch in the lateral recumbent position, using a Sphygmomanometer. The readings should be 140/90 mmHg and 160/100 mmHg in mild preeclamptic women respectively, which was repeated four hour apart .
6. Routine urine analysis was done to exclude UTI
7. Proteinuria was diagnosed by urine dipstick test, showing albumin \geq 2+ or more. A mid-stream urine sample is collected at least 4 hours apart for a dipstick test.

8. Sample collection: Samples were collected 8-12hrs after fasting. Under strict aseptic conditions, 5ml of venous blood was collected from the antecubital vein of each participant into a red top vacutainer to allow it to clot spontaneously. Samples were transported carefully and then centrifuged for 10mins at 3000rpm. Sample analysis was done immediately whenever possible and they are stored at -20°C in case of any delay, for further analysis.

All the findings were recorded, tabulated in excel sheets and analysed statistically using one way ANOVA

PARAMETERS:

In the present study, the samples collected were analysed for the following parameters:

1. Serum Total Cholesterol by CHOD - PAP method.
2. Serum Triglycerides by GPO - POD method.
3. Serum HDL - Cholesterol by Direct Enzymatic method.
4. Serum LDL-Cholesterol calculated by Friedewald formula.
5. Serum VLDL calculated.

RESULTS

The Mean \pm SD Age in controls is 23.72 ± 2.58 in years, in N- Preeclampsia is 24.48 ± 3.37 in years and in severe preeclampsia is 24 years. Age between the study groups is statically not significant.

The Mean + SD period of gestation in controls is 33.77 ± 1.84 in weeks, in Severe preeclampsia is 33.92 ± 1.69 In weeks and in Severe preeclampsia is 34.42 ± 1.35 in weeks. Period of gestation between the study groups is statically not significant.

The Mean & SD Systolic Blood pressure in controls is 110 ± 8.69 mmHg, in Non- Severe Preeclampsia is 144.63 ± 5.4 mmHg and in Severe preeclampsia is 92.41 ± 11.32 mmHg. The Mean + SD Diastolic Blood pressure in controls is 73.89 ± 5.96 mmHg, in Non-Savers

Preeclampsia is 92.41 ± 5.12 mmHg and in Severe preeclampsia is 112.78 ± 4.52 mmHg. There is a high statistical significance in the systolic BP and diastolic BP between the study groups.

The Mean & SD Serum Total Cholesterol levels in controls is 138.3 ± 20.32 mg/dL. in Non-Severe Preeclampsia is 172.08 ± 11.80 mg/dL and in Severe preeclampsia is 205.44 ± 11.18 mg/dL. There is a high statistical significance in the Serum Total Cholesterol levels between the study groups.

The Mean & SD Serum triglyceride levels in controls is 109.98 ± 15.22 mg/dL in Non-Severe Preeclampsia is 148.83 ± 13.13 mg/dL and in Severe preeclampsia is 208.63 ± 20.52 mg/dL. There is a high statistical significance in the Serum triglyceride levels between the study groups.

The Mean & SD Serum HDL-Cholesterol levels in controls is 43.22 ± 6.67 mg/dL. in Non-Severe Preeclampsia is 35.39 ± 2.9 mg/dL and in Severe preeclampsia is 30.57 ± 3.85 mg/dL. There is a high statistical significance in the Serum HDL-Cholesterol levels between the study groups.

The Mean & SD Serum LDL-Cholesterol levels in controls is 73.02 ± 14.21 mg/dL, in Non-Severe Preeclampsia is 106.74 ± 11.81 mg/dL and in Severe preeclampsia is 133.08 ± 12.46 mg/dL. There is a high statistical significance in the Serum LDL-Cholesterol levels between the study groups.

The Mean & SD Serum VLDL-Cholesterol levels in controls is 22.06 ± 2.99 mg/dL, in Non-Severe Preeclampsia is 29.81 ± 2.71 mg/dL and in Severe preeclampsia is 41.72 ± 4.08 mg/dL. There is a high statistical significance in the Serum VLDL-Cholesterol levels between the study groups.

DISCUSSION

Preeclampsia is a pregnancy specific disorder and is the most frequently encountered

complication. 58 The pathophysiology of preeclampsia is still unclear but the possible theories put forward are endothelial dysfunction and abnormal placentation. Lipid peroxidation causes oxidative stress and this is attributed to be the cause for endothelial dysfunction. The present study was conducted to assess the serum lipid profile in already diagnosed preeclamptic woman and in healthy normal pregnant women. The results obtained were compared between the three study groups.

1. Age:

The mean age of controls is 23.72 ± 2.58 , Non-Severe Preeclampsia is 24.40 ± 3.37 and of Severe preeclampsia is 24.98 ± 2.9 . P-value is 0.08 (>0.05), Indicates that there is no statistical significance in the age between the study groups. Results of the present study are in accordance with the study conducted by Abdel et al¹, R.Anuradha et al⁴. In contrast to our study, N. R. Hazari et al⁵ showed a statistically significant decrease in the age with severity in preeclampsia.

2. Period of Gestation

The mean period of gestation in controls is 33.77 ± 1.84 , in Non-Severe Preeclampsia is 33.92 ± 1.69 and in Severe preeclampsia is 34.42 ± 1.35 p-value is 0.1 which is statistically not significant, indicating that there is no difference in period of gestation between the study groups and it is not associated with severity of preeclampsia. Results of the present study are in accordance with the study conducted by Maryam Kasrasian et al⁶, Singh U et al⁷. In contrast to our study, Abdel Azim et al³ showed significant increase in severity of preeclampsia with increase in period of gestation (p-value <0.001)

3. Blood pressure

The Mean systolic blood pressure of controls is 110 ± 8.69 , of Non-Severe Preeclampsia is 146.35 ± 5.4 and of Severe preeclampsia is 92.41 ± 11.32 . The mean diastolic blood pressure of controls is

73.69 ± 5.96, of Non-Severe Preeclampsia is 92.41 ± 5.12 and of Severe preeclampsia is 112.78 ± 4.52. The present study showed that systolic and diastolic blood pressure increase with progression of preeclampsia. Results of the present study are in accordance with the study conducted by N. R. Hazari et al⁵, Abdel Azim et al³ showed a statistically significant increase in severity of preeclampsia with increase in systolic and diastolic blood pressure (p-value <0.001).

4. Serum Lipid Profile:

a. Total Cholesterol-

The mean serum Total Cholesterol of controls is 138.3 ± 20.32, Non-Se Preeclampsia is 172.06 & 11.80 and of Severs preeclampsia is 205.64 ± 11.18 with a P-value of 0.001, which is statistically highly significant. The present study shows that increased cholesterol levels is associated with preeclampsia and the rise is positively correlated with the severity of disease. The present study is in accordance with the study conducted by Singh U et al⁷, R. Anuradha et al⁴, Abdel Azim et al³. The study conducted by Irinyanikan et al⁸ was in contrast with the present study showing that there is no significant increase in cholesterol between the study groups(p-valu>0.05).

b. Serum Triglycerides:

Thus mean serum Triglyouides levels of controls is 109.98.00 ± 15.22, Non severe preeclampsia is 148.83 ± 13. 13 and of Severe preeclampsia is 208.63± 20.52 with a P-value of <0.001 which is highly significant and has positive correlation with the severity of preeclampsia. The present study is similar in the study conducted by Singh U et al⁷. R. Anuradha et al⁴, Abdel Azim et al³, Mittal M et al⁹.

c. HDL Cholesterol

The serum HDL Cholesterol level of controls is 43.22 ± 6.67 , of Non severe preeclampsia is 35.39 ± 2.9 and of Severe preeclampsia is 30.57 ± 3.65 with a P-value of <0.001 which is highly significant and has negative correlation with the severity of preeclampsia. The present study is similar in the study conducted by Singh U et al⁷, Abdel Azim et al³, The study conducted by Kamlesh k et al¹⁰. showed no statistical significance between HDL Cholesterol level and preeclampsia,

d. LDL Cholesterol:

Thus mean serum LDL Cholesterol levels of controls is 73.02 ± 14.2 , Non severe preeclampsia is 106.74 ± 11.81 and of Severe preeclampsia is 133.06 ± 12.46 with a P-value of <0.001 which is highly significant and has positive correlation with the severity of preeclampsia. Results of the present study are in accordance with the study conducted by Kamlesh k et al¹⁰, Abdel Azim et al³. The study conducted by Mittal M et al⁹ was in contrast to the present study.

e. VLDL Cholesterol:

Thus mean serum VLDL Cholesterol levels of controls is 22.06 ± 2.99 Non severe preeclampsia is $29.81.74 \pm 2.71$ and of severe preeclampsia is 41.72 ± 4.08 a P-value of <0.001 which is highly statistically significant and has positive correlation with the severity of preeclampsia. The present study are in accordance with the study conducted by Abdel Azim et al³. Singh U et al⁷. R. Anuradha et al⁴.

The Present study showed that serum lipid profile is associated with the pathogenesis of preeclampsia and can be used as an early investigation tool in preeclampsia.

CONCLUSION

Preeclampsia is a multi-system disorder with unknown etiology and is an important complication

of pregnancy with maternal and fetal morbidity and mortality.

The present study is carried out to establish an association with lipid profile. All these are assessed in 162 pregnant women both normotensive and preeclamptic.

The study showed highly significant association between lipid profile and preeclampsia, in which total cholesterol, triglycerides, LDL, VLDL showed positive correlation and HDL showed negative correlation with severity of preeclampsia

The increase in lipid profiles could be the possible cause for endothelial injury which is considered to be the probable cause of preeclampsia

The study established that lipid peroxidation mediated oxidative stress could be the possible cause for the pathogenesis of preeclampsia

The detection of these biochemical parameters in early pregnancy can help in slowing down of the progression of preeclampsia by early medical intervention. More studies must be conducted in this aspect.

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