IOSR Journal Of Pharmacywww.iosrphr.org
(e)-ISSN: 2250-3013, (p)-ISSN: 2319-4219
Volume 6, Issue 10 Version. 3 (Oct 2016), PP. 41-44

Biochemical Evaluation of Serum Lipid Profile and Serum Uric Acid in Preeclampsia: A Case- Control Study

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Abstract: Introduction/Background: Preeclampsia is a pregnancy specific, multisystem disorder characterized by various biochemical abnormalities. Dyslipidemia and Hyperuricemia have been shown to play a significant role in the pathogenesis of the disease and often precede clinical manifestations.
Objectives: To evaluate Serum lipid profile and uric acid in preeclampsia subjects and to determine if there is any change in these parameters as compared tonormal pregnant women.
Materials and Methods: In our study we have included 35 Preeclampsia and 35 Normal pregnant women. Serum lipid profile and uric acid were estimated by standard methods.
Results: We observedsignificantly increased Serum uric acid and Triglyceride levels ($p<0.001$ and $p<0.05$ respectively) in preeclampsia group compared to control group. Total cholesterol and LDL-C was increased and HDL-C was decreased in preeclampsia group as compared to normal pregnant group but the results were not statistically significant.
Conclusion: Measurement of blood lipids and uric acid may be helpful in early diagnosis and prevention of maternal and fetal complications in preeclampsia.

Keywords: *Preeclampsia, Normal pregnancy, lipid profile, dyslipidemia, uric acid.*

I. INTRODUCTION

Preeclampsia is a pregnancy specific, multisystem disorder characterized by hypertension to an extent of 140/90 mmHg or more accompanied by proteinuria (≥300mg/day), edema or both [1]. It is one of the most common complications of pregnancy and is a leading cause of maternal and fetal morbidity and mortality [2]. Preeclampsia occurs in 7-10% of pregnancies worldwide. In India the incidence is reported to be 8-10% of the pregnancies. Preeclampsia is mainly a disease of primigravida. The incidence is 14.1% in primigravida versus 5.7% in multigravida [2, 3, 4].Without intervention, preeclampsia may progress to eclampsia [1].Family history of hypertension is a known risk factor in the development of preeclampsia [4].Despite considerable research, the etiology of preeclampsia still remains unclear. Many theories have been proposed to explain the pathophysiology of preeclampsia. Endothelial dysfunction is a central feature in preeclampsia [5]. This injury leads to various biochemical alterations.Among various biochemical changes,the association of alteration of serum lipid profile in preeclampsia is well documented. An abnormal lipid profile is known to be strongly associated with atherosclerotic cardiovascular diseases and has a direct effect on vascular endothelial dysfunction as seen in preeclampsia [6]. Maternal symptoms seen in preeclampsia are thought to be secondary to vascular endothelial dysfunction [1]. Increased levels of triglycerides and oxidized low density lipoproteins have been reported to be linked to increased risk of preeclampsia [2].Elevated serum uric acid is another most consistent and earliest detectable parameter of preeclampsia. Hyperuricemia is a common finding in preeclamptic pregnancies. Abnormal renal function, increased tissue breakdown, acidosis and increased activity of the enzyme xanthine oxidase/dehydrogenase may be the reason for elevated serum levels of uric acid in women with preeclampsia [7].Considering various biochemical changes that occur in preeclampsia, it is very important to identify biochemical markers that aid in early diagnosis of preeclampsia avoiding the costly investigations. Thus, in the present study we evaluated the serum lipid profile and uric acid in preeclampsia women and compared them with normal pregnant women.

II. MATERIALS AND METHODS:

The present study is a Case-Control study carried out in the Department of Biochemistry of Sri DevarajUrs Medical College (SDUMC) in collaboration with OBG department of R.L. Jalappa Hospital, attached hospital of SDUMC, Kolar, Karnataka, India over a period of 4 months. The study was approved by Institutional Ethical Committee and informed consent was obtained from all subjects. A total of 70 subjects attending or admitted in the antenatal wards of OBG department were included. The study subjects were divided into 2 groups:Group I (n=35): Clinically diagnosed preeclamptic, Singleton pregnant women with gestational

age of >20 weeks.Group II (n=35): Women having normal uncomplicated pregnancy without hypertensionand with same gestational age.All the subjects were in the age group of 18-35years.The preeclamptic patients were diagnosedby the presence of persistent hypertension (Blood pressure ≥ 140/90 mm Hg), gross proteinuria and edema. We have excluded subjects with Diabetes mellitus, renal diseases like Nephropathy, known Heart disease, Thyroid disease, and Liver diseases in our study as these conditions may alter either lipid profile or uric acid.Blood pressure of all the subjects was measured in supine position using mercury Sphygmomanometer. After 10 hours of fasting, 3ml of venous blood was collected from both study and control groups in plain tubes under complete aseptic conditions. Separated serum was used for the estimation. Serum lipid profile [8] and uric acid [9] were estimated by standard methods using Dry Chemistry Vitros 250 Johnson & Johnson analyzer.

III. STATISTICAL ANALYSIS:

Data was statistically analyzed by SPSS software version 11. The results are expressed as Mean±SD.Correlations between uric acid and various lipid parameters were done using Pearson's correlation coefficient in preeclampsia group. P value <0.05was considered statistically significant and <0.001as highly significant.

IV. RESULTS:

Table 1 shows the Baseline characteristics of both control and preeclampsia groups. Both the groups were comparable with respect to age and gestational age. As depicted in the table systolic and diastolic BP was statistically significant in the preeclamptic group compared to normotensive pregnant women.

Table1: Baseline characteristics of Preeclampsia and Control groups

Parameter	Preeclampsia (n=35) Mean±SD	Control(n=35) Mean±SD	p value
Age(years)	25.08±4.75	23.69±3.03	0.158
Gestational Age (wks)	35.5±3.51	36.4±3.5	0.077
Systolic BP(mmHg)	158.1±18.2	121.9±8.82	<0.001*
Diastolic BP(mmHg)	101.2±9.8	81.21±6.49	<0.001*

*p value <0.001 is considered highly significant.

As shown in the Table 2, serum uric acid and triglycerides were significantly increased (p<0.001 and p<0.05 respectively) in preeclampsia group compared to control group. Total cholesterol and LDL-C was increased and HDL-C was decreased in preeclampsia group as compared to normal pregnant group but the results were not statistically significant.

Table 2: Comparison of Biochemical parameters between Preeclampsia and Control groups

Parameter	Preeclampsia (n=35) Mean±SD	Control(n=35) Mean±SD	p value
Serum uric acid	7.75±1.50	4.50±1.44	<0.001**
Serum Total Cholesterol	229.5±89.63	199.36±62.7	0.113
Serum Triglycerides	300.6±107.38	242.4±93.68	<0.05*
Serum HDL-C	47.75±19.21	54.21±35.91	0.349
Serum LDL-C	119.17±71.81	107.9±49.26	0.462

*p value<0.05 is statistically significant and **p value<0.001 is statistically highly significant.

When uric acid was correlated with lipid fractions (Table 3), positive correlation of uric acid was seen with total cholesterol and HDL-C (r= 0.032; 0.214 respectively) and negative correlation with triglycerides and LDL-C (r= -0.033; -0.037 respectively). But the correlation was not statistically significant.

Table 3: Pearson's correlation of Serum Uric acid with lipid profile parameters and blood pressure

Parameters	r value	p value
Total Cholesterol	0.032	0.854
Triglycerides	-0.033	0.848
HDL-C	0.214	0.209
LDL-C	-0.037	0.834
Systolic BP	0.214	0.211
Diastolic BP	-0.024	0.889

V. DISCUSSION

Normal pregnancy exposes women to profound changes in carbohydrates, protein and lipid metabolism. These changes seem to be even more exaggerated in preeclampsia [5].In the present study we found significantly increased serum triglycerides in preeclampsia group than that in normal pregnant women. We also found increased total cholesterol and LDL-C levels in preeclampsia women the difference between the groups was not significant. Our findings are in accordance with most of the previous studies [2, 3]. Abnormal lipid metabolism in preeclampsia may not be a manifestation but may also be involved in the pathogenesis of disease.Hyperlipidemia during preeclampsia is transient, therefore its pathological role in these women have been ignored.Hypoestrogenemia, seen in preeclampsia, leads to decreased expression of VLDL/apoE receptors resulting in reduced transport of VLDL to fetal compartment and so there is maternal hypertriglyceridemia [3]. Elevated triglycerides may compromise vascular functions in several ways. For example, triglyceride rich lipoprotein has a prothrombotic effect [2]. We found decrease in serum HDL-C concentration compared to normal pregnant women. This is in consistency with the results of several other studies.GohilJ.Tet al demonstrated significant fall in HDL-C in preeclampsia than in non-pregnant and normal pregnant women [2]. They also found gradual rise in HDL-C postpartum. Similarly, study conducted by Rubina Aziz et al concluded significant fall in the level of HDL-C in preeclamptic women [10]. Increased triglycerides play a role in increased atherogenic small dense LDL and reduced HDL [3, 10]. A low level of HDL-C hinders reverse cholesterol transport,which may be a reason for the atherosclerosis like features in preeclampsia mentioned in some studies [2].In the present study, we also found increased serum uric acid level in preeclamptic women which was statistically significant. Our result is in agreement with other studies [1, 4, 7].Elevated serum uric acid often precedes clinical manifestations of the disease. S.A.Bainbridge et al observed hyperuricemia in 75% of women with clinically diagnosed preeclampsia [7]. Uric acid, an end product of purine catabolism catalyzed by xanthine oxidase, is filtered, reabsorbed and secreted by the kidney.In preeclampsia, glomerular endothelial lesions lead to diminished renal blood flow and glomerular filtration rate and also impaired tubular reabsorption. Hyperuricemia in preeclampsia is thus primarily due to decreased renal clearance and increased tubular reabsorption, because of the reduction in glomerular filtration rate [1]. On the other hand, an elevated level of uric acid reflects the increased uric acid production. In preeclampsia due to placental hypoxia, degree of placental cell destruction increases, which are the rich sources of purine for the production of uric acid by xanthine oxidase [11].This could also explain the increased uric acid concentration.

VI. CONCLUSION:

In summary, in our study we found abnormal lipid levels and increased uric acid in preeclampsia group in comparison to normotensive, normal pregnant women. Thus, results of our study add to the existing evidence to support pathophysiological roleof both dyslipidemia and hyperuricemiain the clinical manifestations of preeclampsia. Therefore simple estimation of serum lipid profile and uric acid may behelpful in the early diagnosis and prevention of maternal and fetal complications avoiding costly investigations.However, further investigations with larger sample size will be necessary to clarify the changes in these parameters in various trimesters of pregnancy and post-delivery.

7. Conflict of interest: Nil

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