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"Serum Uric Acid Levels and Lipid profile in Preeclampsia Patients from Raigarh Chhattisgarh State"

KEYWORDS: BMI, Lipid profile, PIH, Preeclampsia, Uric Acid

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ABSTRACT

BACKGROUND: Hyperuricemia is one of the earliest and most consistent observations noted in preeclamptic pregnancies. It is a common cause of both maternal and perinatal morbidity and mortality in both developed and developing countries.

AIMS & OBJECTIVES: To Study Serum Lipid profile & Uric Acid level in Hypertensive Disorders of Pregnancy.

METHODS: A prospective case control study was conducted at Dept. of Biochemistry & Obstetrics and Gynecology of Late Shri Lakhiram Agrawal Memorial Medical College & Kirodimal Govt. hospital Raigarh Chhattisgarh. 30 cases of PE mothers and 30 normal healthy pregnant women served as control in this present study. Uric acid estimation was done by Uricase Peroxidase method while Lipid profile estimation was done by Cholesterol oxidase & Peroxidase method. SPSS version 16.0 was used for statistical analysis, student t-test and Pearson correlation were performed and p <0.05 is considered as statistically significant.

RESULTS: The mean triglycerides (TG), total cholesterol (TC), LDL-cholesterol (LDL), VLDL (mg/dl), AST (IU/L), ALT (IU/L) ALP (IU/L), SBP and DBP levels were significantly higher in preeclampsia patients as compared to control. HDL-cholesterol (HDL), Urea (mg/dl) and Creatinine (mg/dl) were significantly lower in preeclampsia patients.

CONCLUSION: The result showed that increase level of serum uric acid & lipid profile in PE pregnant women's. Increase level of serum uric acid & lipid profile are major role of pathogenesis & good marker for early diagnosis of PE Pregnant women.

Introduction

Pre-eclampsia is a serious form of hypertensive disorder of pregnancy characterized by hypertension, proteinuria with or without pathological edema. It is a common cause of both maternal and perinatal morbidity and mortality in both developed and developing countries.[1] Uric Acid is the end metabolite product of purine metabolism. Which is filtered through glomeruli and most is reabsorbed from the proximal tubular lumen.[2] Serum Uric Acid, Albumin and Creatinine levels as biochemical markers for the prediction of the subsequent development of Pre-eclampsia, were reported to be performed late in the second and third trimesters of pregnancy when the disease process usually manifests.[3, 4] Uric acid is a potent mediator of inflammation. In vascular smooth muscle cells uric acid also stimulates human monocytes to produce the pro-inflammatory cytokines IL-1β IL-6 and TNF-α causes endothelial dysfunction & vasospasm in preeclamptic patients [(5, 6)]. Altered lipid metabolism results in more oxidative stress. Lipid peroxides, reactive oxygen spices & superoxide anion radical's causes endothelial injury and dysfunction leading to decrease in PGI2: TXA2 ratio and an imbalance between lipid peroxidation and antioxidant mechanisms may impair endothelial function leading to the manifestation of preeclampsia [(7)]. In preeclamptic patients other risk factor like obesity, those pregnant women with a body mass index >35 kg/m^2 13.3% more chance as compared to body mass index < 20 kg/m^2[(8)]. Additionally, the hormonal imbalance is a prime factor for the etiopathogenesis of PIH and this endocrinal imbalance is well reflected in alteration of serum lipid profile.[4, 8] In parental blood serum various biochemical markers have been identified of pre-eclampsia disorder. These comprise uric acid, total cholesterol, Triglycerides (TG), High-Density Lipoprotein (HDL), Low-density lipoprotein (LDL), *Very low-density lipoprotein* (VLDL), Urea, Creatinine, Aspartate Aminotransferase (AST), Alanine Aminotransferase (ALT), and Alkaline Phosphate (ALP). As compared to normotensive individuals the plasma creatinine level have been significantly higher in preeclampsia patients.[5,8] Various studies reported that evaluation of serum uric acid, albumin and creatinine levels as biochemical markers for the prediction of the subsequent development of pre-eclampsia, studies were carried out after completion of second and third trimesters of pregnancy in these stage progression of disease was generally noticeable. [6,8] Thus, this experimental research carried out onetime assessment of uric acid, total cholesterol, Triglycerides (TG), High-Density Lipoprotein(HDL), Low-density lipoprotein (LDL), *Very low-density lipoprotein* (VLDL), Urea, Creatinine, Aspartate Aminotransferase (AST), Alanine Aminotransferase (ALT), and Alkaline Phosphate (ALP) levels of preeclampsia case and control group at the Late Shri Lakhiram Agrawal Memorial Medical College, Raigarh, Chhattisgarh India.

Materials and Methods

This study was done in Department of Biochemistry, Late Shri Lakhiram Agrawal Memorial Medical College & Kirodimal Govt. Hospital Raigarh Chhattisgarh.

Recruitment of subjects

The study group comprised of 60 subjects with age group between 20-28 Years. The group was divided into two subgroups viz., Normal pregnant women as Controls (30 subjects) & Preeclampsia as cases (30 subjects). Preeclampsia pregnant women subject group were diagnosed as when the SBP were persistently ≥ 140 mm Hg and DBP ≥ 90 mm Hg, on two occasion each 6 hours apart, accompanied by proteinuria more than 1+ (0.3 gm/L) or ≥2+ (1.0 gm/L) on at least two random clean-catch urine samples tested ≥ 4 hours by dip stick testing at third trimester of gestation. Normal pregnant women subject group was diagnosed on the basis of clinical examinations, biochemical and ultrasound findings. All women had gestational ages of 20-30 weeks preferably primigravida, single ton fetus included. They were non smokers and non alcohol drinkers. Patients with any other history of gout, renal disease, chronic hypertension, cardiovascular disease, thyrotoxicosis, liver diseases, were excluded from this study. This is evaluated by taking medical history, surgical history and drug history from each subjects.

Sample Collection and laboratory analysis

After getting written informed consent, blood sample were drawn from all the subjects following a fasting of 8 hours. Five milliliter of venous blood was collected from subjects in plain vacutainer under aseptic precautions. Uric acid estimation was done by Uricase Peroxidase Method using Autospan kit while Lipid profile estimation was done by Cholesterol oxidase & Peroxidase method. Serum Triglycerides (TG), Total choles-

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terol (TC) and HDL cholesterol estimation was done by enzymatic methods using Autospan kits on HI- TECH SB-501 semi automatic biochemistry analyzer. Serum LDL cholesterol was calculated by Frederickson-Friedwald's formula according to which LDL cholesterol = Total cholesterol - (HDL cholesterol + VLDL cholesterol). VLDL cholesterol (VLDL-C) was calculated as 1/5 of Triglycerides. Serum urea, creatinine, Serum SGOT, SGPT, Alkaline phosphatase, albumin, total and direct bilirubin estimation was done by using Autospan kits on HI-TECH SB-501 semi automatic biochemistry analyzer to rule out renal & liver disease.

Statistical Analysis
Statistical analysis was done by using SPSS version 20. Data was presented as mean and standard deviation (SD). Student's t-test, correlation were used to analyze the observed data. P value <0.05 was considered to be statistically significant.

Results
A total of 30 patients with preeclampsia were recruited for this study. The control group of gestational age-matched women had 30 subjects. The mean age, gestational age (GA) and body mass index (BMI) were not significantly different between the two groups [Table 1]. The mean triglycerides (TG), total cholesterol (TC), LDL-cholesterol (LDL), VLDL (mg/dl) and serum uric acid (UA) levels were 61.83%, 42.14%, 34.51%, 12.37% and 1.75%, respectively higher in the preeclamptic group than the normotensive women [Table 2]. The mean HDL-cholesterol (HDL), Urea (mg/dl) and Creatinine (mg/dl) levels were 4.64%, 3.83% and 0.10% lower in the women with severe preeclampsia than the normotensive women. The liver function tests i.e. AST (IU/L), ALT(IU/L) and ALP(IU/L) were 11.49%, 8.07% and 5.77% respectively higher in the preeclamptic group than the normotensive women [Table 2]. The mean arterial blood pressure (MABP) SBP and DBP of the preeclamptic was 17.39% and 10.20 % higher than the normotensive women (110. 93±5.45mmHg versus 163.10± 10.93, *P* <0.001; 69.07±4.29 mmHg versus 99.67±6.22).

The observation was compared between normotensive and preeclampsia using the Independent sample t-test.

Statistically significant decreases in all the parameters were witnessed between both the groups (Figure 7(a, b, c, d, e, g, h, k, l). The levels of lipid profile was significantly higher in preeclampsia as compared with normotensive pregnant women i.e. (p<0.001) TG, total cholesterol (TC) (p<0.001), LDL-cholesterol (LDL) (p<0.001), VLDL (mg/dl(p<0.001)) and serum uric acid (UA) (p<0.001) as well as levels of AST (IU/L), ALT(IU/L) and ALP(IU/L) also significantly higher in preeclampsia group. The reading of SBP (p<0.001) and DBP (p<0.001) were also significantly higher in preeclampsia group, whereas other parameters, such as HDL (p<0.001), Urea (mg/dl) (p<0.001) and Creatinine (mg/dl) (p<0.001) were significantly lower in preeclampsia patients as compared to normotensive control group. (Figure 7(f, I, J).

All the parameters of case and control group are significantly correlated with others (Table 3).

Discussion
This study was designed to prospectively evaluate the possibility of early prediction of the subsequent development of pre-eclampsia using single estimation of levels of some known biochemical substances affected by the disease in serum samples of healthy primigravida with singleton pregnancy. The selection of primigravida with singleton pregnancy was based on the knowledge that these groups of women are more prone to developing the disease when all other risk factors are excluded.

Those with conditions that could place them at increased risk of the disease such as multiple gestation, chronic hypertension, diabetes mellitus and renal disease were carefully excluded from the study.

The concomitant study of several tests was to compare their respective performances alone and in combination. The mean systolic and diastolic blood pressure and the mean arterial pressure values at delivery were all significantly higher in the pre-eclampsia group. This was expected in view of the criteria used for the diagnosis of the disease. The mean arterial pressure (MAP) has been shown to be predictive of pre-eclampsia, although some other studies indicated otherwise.

There was no significant difference in the mean values of uric acid and creatinine in the two groups. This was contrary to the findings of other workers that serum uric acid and creatinine levels are usually raised in patients destined to develop pre-eclampsia. However, the inclusion criteria used in some of these studies were slightly different from those of the present study. For instance, some of the studies included patients with mixed parity (nulliparous and multiparous women), some with chronic hypertension and renal disease. In addition the tests were carried out late in pregnancy when the effects of the disease were often manifest with patients already having symptoms. It was also possible that the effect of pre-eclampsia on the renal system early in pregnancy might be minimal as to produce any detectable change in the serum levels of these substances. Hayashi et al demonstrated that abnormally high blood creatinine levels are seldom observed and those of uric acid often are normal even though the clearance was reduced in patients' with preeclampsia. It was interesting to find that the mean serum albumin concentration in those remained normotensive was lower than that of the pre-eclampsia group, although the values were within the normal range. This was at variance with the generally known concept of hypoalbuminemia being a feature of pregnancies complicated by pre-eclampsia. However, significant proteinuria was not a feature of the patients at booking when the estimations were made, therefore, a larger study is required to properly define the value of serum albumin estimation early in pregnancy in the prediction of pre-eclampsia

Conclusion
Serum Uric Acid levels can act as a potential markers for early detection of PIH, thereby helping in initiating early treatment to minimize the complications of PIH. Serum uric acid estimation can play a good diagnostic measure in recognizing the severity of the disorders and also to take prior decision to make the delivery safe and hazardless both for mother and the fetus. Estimation of serum uric acid used as markers for early diagnosis of PE and can be reduced maternal as well as fetal morbidity and mortality.

Figure legend 1. Comparison of mean, namely SBP (a), DBP (b), Uric Acid (c), Total cholesterol (d), TG (e), LDL (f), VLDL (g), Urea (h), Creatinine (I), AST (j), ALP (K) and ALT (L) Normotensive and preeclampsia

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Ethical Approval: The study was approved by the Institutional Ethics Committee.

Table 1: Maternal characteristics of study groups (Normotensive and Pre-eclampsia)

Maternal characteristics of study groups				
S. No.		Normotensive (n=30)	Pre-eclampsia (n=30)	Significance (p-value)
1.	Mean maternal age (years)	24.53±2.03	23.93±2.08	<.001

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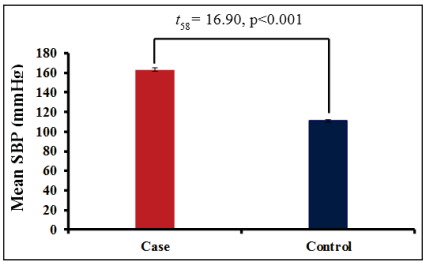
2.	Mean gestational age at booking (weeks)	24.93±2.43	25.10±2.43	<.001
3.	Mean systolic blood pressure at booking (mmHg)	163.10±10.93	110.93±5.45	<.001
4.	Mean diastolic blood pressure at booking (mmHg)	99.67±6.22	69.07±4.29	<.001
5.	Uric Acid(mg/dl)	9.29±1.66	4.04±0.95	<.001
6.	T. Chol.(mg/dl)	168.73±9.48	295.17±12.83	<.001
7.	TG(mg/dl)	66.50±10.10	252±18.50	<.001
8.	HDL (mg/dl)	38.93±5.22	25 ±2.61	<.001
9.	LDL(mg/dl)	116.50±7.35	220.03±11.84	<.001
10.	VLDL(mg/dl)	13.30±2.02	50.4±3.70	<.001
11.	Urea(mg/dl)	24.53±3.56	13.03±2.19	<.001
12.	Creatinine(mg/dl)	0.80±0.19	0.49±0.15	<.001
13.	AST(IU/L)	23.40±4.85	57.87±6.56	<.001
14.	ALT(IU/L)	24.67±3.79	48.87±16.07	<.001
15.	ALP(IU/L)	415±.84	58.30±7.19	<.001

Values are mean ± SD *P<0.05, **P<0.01, ***P<0.001significant
Predictive levels-
Albumin < 4gm/dl
Creatinine > 88.4µmol/l
Uric acid > 0.21mmol/L
Uric acid/creatinine ratio >0.002

Table 2: Summary of the Age characteristics of study groups (Normotensive and Pre-eclampsia).

S.N.		Normotensive (n=30)	Pre-eclampsia (n=30)	*t* value; df; p value
1.	Maternal Age	24.53±0.37	23.93±0.38	1.13; 58; 0.26
2.	Guest Age	24.93±0.44	25.10±0.44	0.26; 58; 0.79
3.	BMI	22.23±0.83	21.42±0.72	0.73; 58; 0.47

*Values are mean ± SEM



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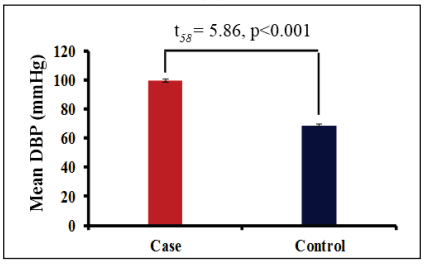

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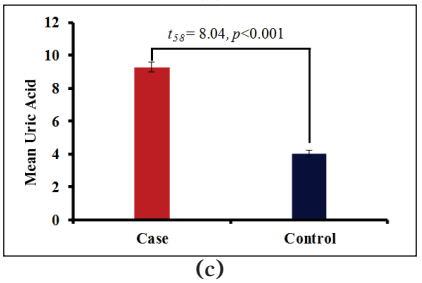

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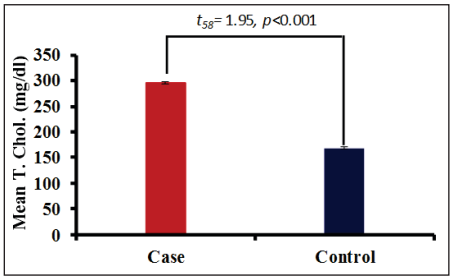

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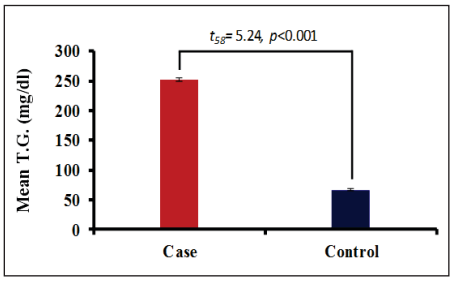

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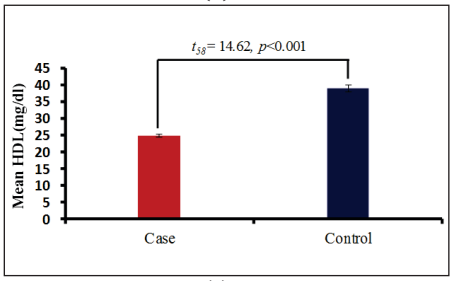

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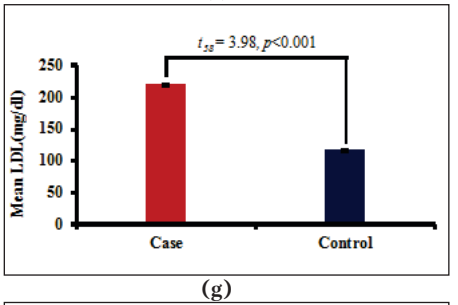

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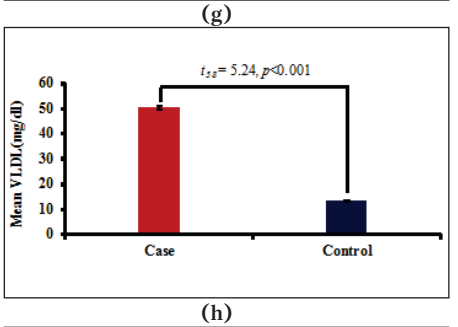

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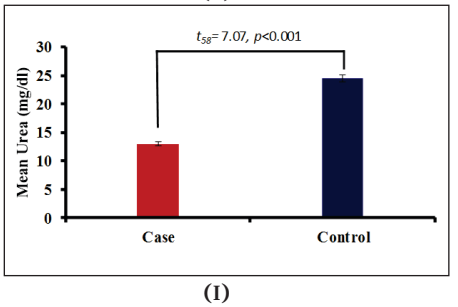

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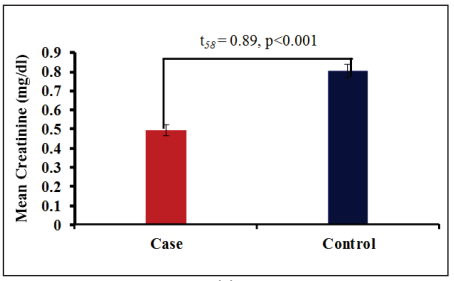

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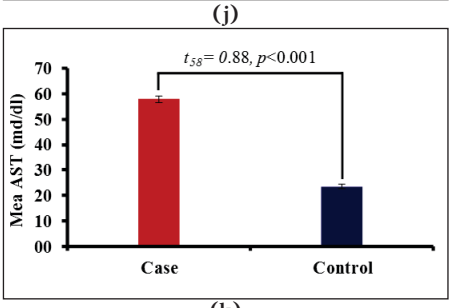

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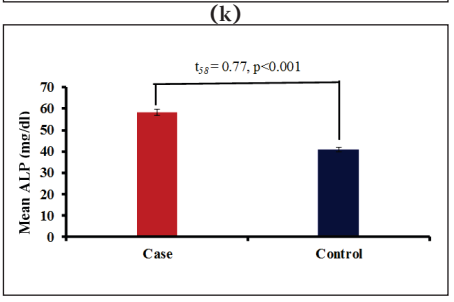

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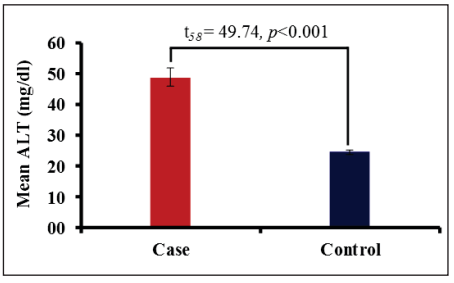

(m)

Figure 1. Comparison of mean, namely SBP (a), DBP (b), Uric Acid (c), Total cholesterol (d), TG (e), LDL (f), VLDL (g), Urea (h), Creatinine (I), AST (j), ALP (K) and ALT (L) Normotensive and preeclampsia.

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