



## SERUM URIC ACID, TRIGLYCERIDES, TOTAL CHOLESTEROL AND HDL-C MEASUREMENTS IN PRE-ECLAMPTIC WOMEN

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### ABSTRACT

The present study has been undertaken to compare the maternal serum values of uric acid, triglycerides, total cholesterol and HDL-C between pre-eclamptic women and normotensive pregnant women. Study includes 80 women divided into two groups. Estimation of serum uric acid, triglycerides, total-cholesterol and HDL-C were analyzed by Modified Trinder Peroxidase, CHOD-PAP and Phosphotungstic acid precipitation method, using Erba Chem-5 plus semi-autoanalyser. Our results shows the mean maternal age and gestational age of group-I were statistically significant ( $p < 0.05$ ) than group-II. The systolic, diastolic blood pressure of group-I women were significantly higher than group-II women. Mean serum uric acid and triglycerides levels were significantly increased in group-I in comparison to group-II,  $p < 0.05$ . There was no difference in the mean values of total-cholesterol between cases (group-I) and control (group-II),  $p > 0.05$ ; but the mean levels of HDL-C were significantly higher in group-II in compared to group-I,  $p < 0.05$ . Women having pre-eclampsia had elevated levels of serum uric acid and altered triglycerides, total cholesterol and HDL-C values in maternal serum. These levels may have cause and effect relationship with these disorders.

**KEY WORDS:** Uric acid, triglycerides, total cholesterol, pre-eclamptic women. HDL-C



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## INTRODUCTION

Pre-eclampsia is a non-convulsive form of hypertensive disorder of pregnancy<sup>1</sup>. Incidence of preeclampsia in India is reported to be 8-10% of pregnancies. In the United States of America (USA) preeclampsia occurs in 2.6% of pregnancies and eclampsia in 0.056% of pregnancies<sup>2</sup>. The diagnosis of pre-eclampsia (International Society for the Study of Hypertension in Pregnancy) is determined by the presence of elevated blood pressure combined with significant proteinuria ( $\geq 0.3$  g/24 hours) after the 20th week of gestation in a previously normotensive, non-proteinuric patient<sup>3</sup>. Various studies suggests that changes in serum uric acid, cholesterol, triglycerides and HDL-C levels during pregnancy is associated with poor perinatal outcomes, including preterm birth and small-for-gestational-age (SGA) infants<sup>4</sup>. Changes uric acid and lipid profile are associated with metabolic syndrome, these conditions could have opposing or perhaps synergistic effects on maternal and fetal health<sup>5</sup>. In women who go on to develop pre-eclampsia, uric acid concentration is elevated as early as 10 weeks of gestation, at a time much earlier than clinical presentation of the disorder. An association between elevated serum uric acid levels and pre-eclampsia was first reported by Slemons and Bogert in 1917<sup>6</sup>. Many authors believed that uric acid is one of the most consistent and earliest detectable changing parameter occurs in pre-eclampsia and have been cited as a better predictor of fetal risk than blood pressure<sup>7,8</sup>. There are several proposed mechanisms for elevation of uric acid in the pre-eclampsia, such as abnormal renal clearance, increased tissue breakdown, acidosis and a rise in the activity of the xanthine oxidase / dehydrogenase enzyme<sup>7</sup>.

The association of alteration in serum cholesterol, triglycerides and HDL-C in essential hypertension is well documented<sup>9</sup>. Various studies claim that abnormal lipid synthesis leading to increase of thromboxane level and the decrease of prostaglandin levels as well as the imbalance of lipid peroxidase and antioxidants is responsible for pre-eclampsia<sup>9</sup>. There is a

positive correlation between serum triglycerides and systolic blood pressure as well as diastolic blood pressure in pre eclampsia cases<sup>10</sup>. Hormonal imbalance leading to altered lipid profile in serum is assumed to be the prime factor in etiopathogenesis of pregnancy - induced hypertension (PIH)<sup>9</sup>. Prasad NK et al who in 1989 suggested that triglyceride level up to 150 mg% is desirable range for Asian population but triglycerides levels in between 150-170mg% is borderline risk group and 170 mg% is high risk group for developing cardiovascular complications<sup>11</sup>. Serum uric acid and lipid profile (especially cholesterol, triglycerides and HDL-C) appear to be of immense value in understanding the pathogenesis of pre-eclampsia. In this context, the present study has been undertaken to evaluate the changes in serum level of uric acid, cholesterol, triglycerides and HDL-C in normal pregnancy and in pre-eclamptic women in Rohilkhand region of Uttar Pradesh.

## MATERIALS AND METHODS

Case control study was conducted at the Department of Biochemistry, Rohilkhand Medical College and Hospital (RMCH), Bareilly, Uttar Pradesh. The duration of study was 12 months, from January 2012 to December 2012. Total 80 women were selected for the study and divided into two different groups. Group-I included forty diagnosed pre-eclamptic women. They were recruited for the study from the Department of Obstetrics and Gynecology, RMCH Bareilly after taking their due written consent. The subjects were in the age group of 21 to 34 years. Group II included forty healthy normotensive pregnant women with age's ranges from 20-32 years receiving antepartum care at the outpatient, Department of Obstetrics and Gynecology, RMCH, Bareilly. While selecting the subjects, care was taken that none of them was suffering from diabetes mellitus, cardio-vascular diseases, renal diseases, pre-existing hypertension, hemophilia and also not under the treatment of

antifolate drug therapy. All the procedures reported here in the study have followed the guidelines approved by the locally appointed ethical committee. Venous blood samples were collected from antecubital vein after an overnight fasting from all participant's with aseptic precautions. Blood samples were allowed to clot at room temperature and the serum was separated by centrifugation. The estimation of the parameters was carried out within 4-6 hrs. The following tests were done in each sample during the study.

- a) Serum uric acid by Modified Trinder Peroxidase method<sup>12</sup>
- b) Serum Total Cholesterol by CHOD-PAP method<sup>13</sup>
- c) Serum Triglycerides was measured by GPO-PAP method<sup>14</sup>
- d) HDL- Cholesterol estimation by Phosphotungstic acid precipitation method<sup>15</sup>

**Statistical Analysis**

Data were presented as mean ± SD. Comparison of serum levels of the parameters

between cases and control was performed by student's t test and p < 0.05 was considered as statistically significant.

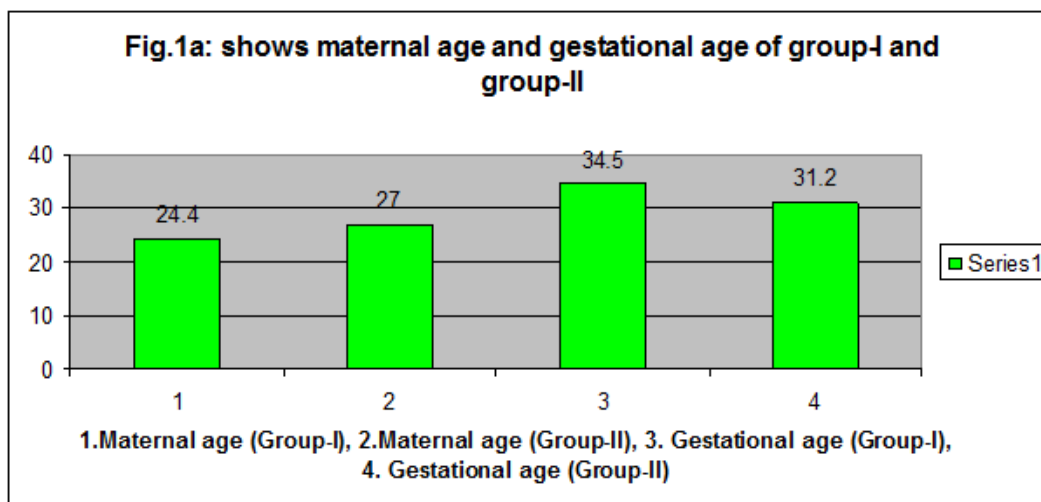
**RESULTS**

Table 1(a,b) and Fig.1(a,b) shows the maternal characteristics of the study groups. The mean maternal age of group-I and group-II women were 24.4 ± 3.1 and 27.0 ± 3.3 years. A majority of the women were in the age group of 23 to 28 years. There was statistical difference (p < 0.05) in maternal age between pre-eclamptic pregnant women (group-I) in comparison to normotensive pregnant women (group-II). Of the 40 pre-eclamptic patients 25 were primigravida (62.5%) and 15 were multigravida (37.5%). The mean gestational age of pre-eclamptic women in group-I was statistically significant in comparison to normotensive pregnant women in group-II [Table 1 (a); Fig. 1 (a)].

**Table-1a & 1b Shows the maternal characteristics of group-I and group-II**  
**Table-1a**

Study Groups	Maternal age (years) mean ± SD	Gestational age (week) mean ± SD	Primigravida	Multigravida
Group-I (Pre-eclamptic women)	24.4 ± 3.1	34.5 ± 2.2	25 (62.5%)	15 (37.5%)
Group-II (Normotensive pregnant women)	27.0 ± 3.3	31.2 ± 2.3	21 (52.5%)	19 (47.5%)

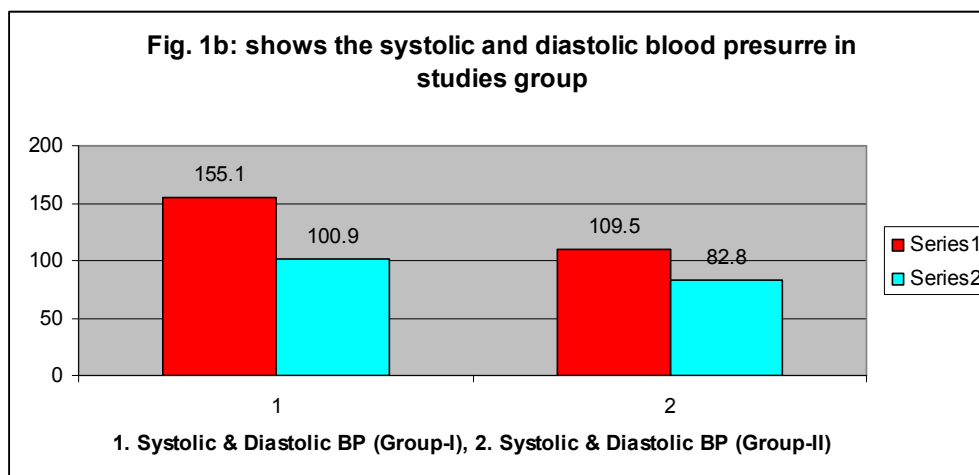
*Maternal age: group-I vs. group-II; p < 0.05,  
Gestational age group-I vs. group-II; p < 0.05*



*The systolic and diastolic blood pressures of cases (pre-eclamptic women) were highly significant (p < 0.05) in compared to control (normotensive women) [Table-1 (b); Fig. 1(b)].*

**Table-1b**

Blood Pressure	Group-I	Group-II	Statistical relationship of group-I vs. group-II
Systolic BP(mm of Hg)	155.1 ± 5.2	109.5 ± 6.5	p< 0.05
Diastolic BP (mm of Hg)	100.9 ± 6.05	82.8 ± 5.7	p< 0.05

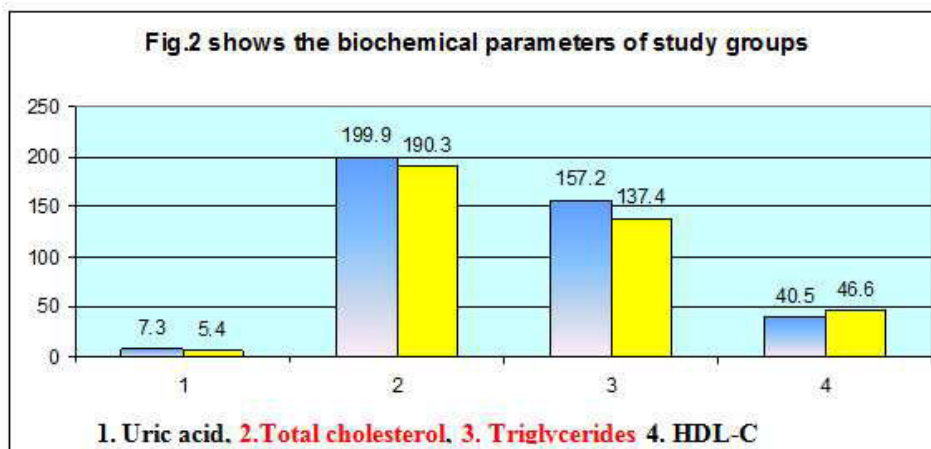


The serum uric acid and triglyceride levels were significantly elevated in group –I women as compared to group-II women (p < 0.05). But mean serum HDL-C value was significantly lower in group-I in compared to group-II women. There was no significant different (p > 0.05) in the mean value of total cholesterol between pre-eclamptic women (group-I) vs. normotensive women (group-II) [Table-2, Fig- 2].

**Table 2**  
**Shows the biochemical parameters of the study groups**

Parameters	Group-I	Group-II	t value	Statistical relationship of group-I vs. group-II
Uric acid (mg/ dl)	7.3 ± 0.6	5.4 ± 1.03	-11.2	p< 0.05 <b>HS</b>
Total Cholesterol (mg/dl)	199.9 ± 24.1	190.3 ± 25.7	1.62	p=0.113 <b>NS</b>
Triglycerides (mg/dl)	157.2 ± 31.2	137.4 ± 29.2	3.11	p=0.03 <b>S</b>
HDL-Cholesterol (mg/dl)	40.5 ± 7.9	46.6 ± 6.1	-4.03	<0.05 <b>HS</b>

**HS= Highly Significant, NS= Not Significant, S= Significant**



## DISCUSSION

Pre-eclampsia is a multisystem endothelial disease that leads to glomeruloendotheliosis, and in severe cases it may lead to renal impairment and failure<sup>6</sup>. The present results showed that the clinical characteristics and maternal serum uric acid, triglycerides, total cholesterol and HDL-cholesterol (HDL-C) levels in pre-eclamptic women (group-I) and normotensive pregnant women (group-II). Mean maternal age of pre-eclamptic women (group-I) was statistically significant than normotensive pregnant healthy women (group-II), ( $p < 0.05$ ). There was an also statistical difference in the mean gestational age between pre-eclamptic women and normotensive pregnant women ( $p < 0.05$ ). The mean systolic and diastolic blood pressure in pre-eclamptic women (group-I) was significantly higher than normotensive pregnant women (group-II) (Table 1-b, Fig. 1-b). From table-2 & Fig. 2; we observed that the mean serum uric acid levels in the present study significantly higher in group-I (pre-eclamptic women) than group-II (normotensive pregnant women),  $p < 0.05$ . Our results agree with previous findings of some authors<sup>16-21</sup>. A decreased glomerular filtration rate may contribute to an increased uric acid, but this likely occurs later in pregnancy closer to the time of pre-eclampsia diagnosis<sup>17</sup>. Some authors are believed hyperuricemia results from increased production secondary to tissue ischemia and oxidative stress<sup>16</sup>. Soluble uric acid impairs nitric oxide generation in endothelial cells. Thus hyperuricemia induces endothelial dysfunction and may induce hypertension and vascular disease<sup>22</sup>. But in some authors namely Salako BL et al<sup>23</sup>, Weerasekera DS et al<sup>24</sup> did not find any significant difference in mean serum uric acid levels between pre-eclamptic women (group-I) and normotensive pregnant women (group-II).

Physiological hyperlipidemia involving rise in blood triglycerides and total cholesterol levels in normal pregnancy. In the current study we compared the maternal serum triglycerides, total cholesterol and HDL-C values in pre-eclampsia and normotensive cases and found that the

patients of group-I (pre-eclampsia) have a significant difference in serum triglyceride as compare to group-II (control) subject ( $p < 0.05$ ). In this study the mean  $\pm$  SD serum triglycerides of group-I participants were ( $157.2 \pm 31.2$ ) more than the mean  $\pm$  SD serum triglycerides of group-II ( $137.4 \pm 29.2$ ) participants. These findings are in agreement with work of many authors<sup>25-27</sup>. Jayanta et al. 2006 reported that a triglyceride level during pregnancy is elevated because of hyperestrogenaemia. Estrogen inhibits the hepatic lipid oxidation so the net effect is increased delivery of free fatty acids into hepatic biosynthesis of endogenous triglycerides which carried by VLDL<sup>28</sup>. But some authors believed that the increase level of triglycerides in pre-eclampsia is probably not due to hyperestrogenaemia as the levels of estrogen decreases in pre-eclampsia. Another hypothesis for increase level of triglycerides in pre-eclampsia is that hyper-triglyceridemia is probably a consequence of competition between the substrates chylomicron and very low-density lipoprotein cholesterol for the enzyme lipoprotein lipase. Classically, chylomicron clearance occurs in two sequential steps: (a) Triglyceride hydrolysis by the enzyme lipoprotein lipase, (b) Uptake of the remnant by the liver. Delay in the second step leads to accumulation of remnants in plasma and is generally thought to represent the atherogenic risk of hyper-triglyceridemia<sup>7</sup>. Elevation in triglyceride, found in pre-eclampsia is likely to be deposited in predisposed vessels, such as uterine spiral arteries and contributes to the endothelial dysfunction, both directly and indirectly through generation of small dense low-density lipoprotein cholesterol (Sattar et al. 1997)<sup>29</sup>. But we could not observe any significant change in maternal serum TC (total cholesterol) level in these studied groups. This finding is similar to previous studies conducted by NAF Islam et al<sup>25</sup>, Jayanta et al<sup>28</sup>, Sattar et al<sup>29</sup>. From table-2, Fig-2. ; we also observed that the mean  $\pm$  SD of serum HDL-C level ( $46.6 \pm 6.1$ ) increases in group-II (normotensive) cases as compared to mean  $\pm$  SD serum HDL-C ( $40.5 \pm$

7.9) levels in group-I (pre-eclampsia). Similar finding was reported by other authors<sup>25, 30</sup>. In normotensive pregnant women, the increase in HDL-C value is due to hyperestrogenaemia. But

in pre-eclampsia, the estrogen level is decreased, so reduced serum HDL-C level were observed<sup>30</sup>.

## CONCLUSION

From the present study it is found that pre-eclampsia is common in primigravida cases and disturbed biochemical parameters like uric acid, triglyceride, total cholesterol and HDL-C. This association may be significant in understanding the pathological processes of pre-eclampsia and may help in developing strategies for prevention and early diagnosis of pre-eclampsia.

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