Section: Biochemistry

Original Research Article

ASSOCIATION OF SERUM LIPID PROFILE & URIC ACID LEVELS IN PREECLAMPSIA PATIENTS IN RAMA MEDICAL COLLEGE HOSPITAL & RESEARCH CENTER

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Abstract

Background: Pre-eclampsia, one of the most frequent medical complications during pregnancy, causes significant morbidity and mortality in both the mother and the fetus. One of the main characteristics of pre-eclampsia is endothelial dysfunction. Elevated serum uric acid levels may be used as a surrogate for clinical severity of the condition and as a diagnostic for early disease identification. The risk of having preeclampsia is strongly correlated with serum levels of triglycerides, total cholesterol, low-density lipoprotein, and high-density lipoprotein. **Materials and Methods:** The study population includes 110 subjects attending both outpatients and inpatients department of Rama Medical College & Research Centre. A total of 110; out of which 55 known patients of preeclampsia and 55 normal pregnancy. **Result:** Mean value of Systolic blood pressure in cases and controls respectively. Higher mean Systolic blood pressure (152.0±4.45) in 20-29 age group and (151.4±4.35) in 30 & above age group is recorded in cases compared to controls; and the variance in mean systolic blood pressure among the cases and controls are found to be statistically significant with p value 0.000. **Conclusion:** This study's findings suggest that preeclampsia is more prevalent in young people and low-income areas because of their diets' lack of protein. Therefore, during early antenatal visits, clinicians should assess pregnant women's serum lipid profiles and uric acid levels. Doing so will aid in the early detection of preeclampsia and the prevention of obstetric complications like eclampsia, ante-partum hemorrhage, and preterm labor linked to preeclampsia.

INTRODUCTION

When a woman is known to be normotensive before becoming pregnant and before the 20th week of gestation, gestational hypertension is defined as a systolic blood pressure (SBP) of at least 140 mm Hg and/or a diastolic blood pressure (DBP) of at least 90 mm Hg on at least two occasions at least 6 hours apart.[1] Pre-eclampsia is generally understood to be gestational hypertension along with proteinuria of 300 mg or more per day. Proteinuria is defined as a concentration of at least 30 mg/dL in at least two random urine samples obtained at least six hours apart if 24-hour urine collection is not possible.[2]

Preeclampsia is one of the most prevalent pregnancy complications, affecting 2-8% of all pregnancies and causing significant morbidity and mortality in both the mother and the fetus.[3] It is thought to be caused by inadequate uteroplacental perfusion, a maternal inflammatory response, and vascular endothelial dysfunction in the mother.[4] One of the most reliable and early detectable indicators of pre-eclampsia is elevated blood uric acid. It has been discovered that the rise in uric acid levels occurs before the onset of proteinuria and hypertension, which are used to diagnose pre-eclampsia.[5] It is further postulated that an increased uric acid level in pre-eclamptic women is not just a sign of a severe illness, but also directly contributes to the

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pathophysiology of the condition.[6] The possible causes of elevated serum uric acid levels in preeclamptic women include decreased renal clearance due to reduced glomerular filtration rate, increased renal reabsorption and decreased tubular secretion, increased tissue breakdown, and increased activity of the enzyme xanthine oxidase/dehydrogenase.[7] Pre-eclampsia is characterized by maternal endothelial dysfunction. Increased levels of circulating lipids cause the endothelial cells to accumulate signs of endothelial dysfunction.[8,9] Due to the development and growth of the fetus, there is maternal hyperlipidemia during a normal pregnancy. High levels of atherogenic lipids, such as high total cholesterol (TC), triglycerides (TG), low density lipoprotein cholesterol (LDL-C), and low levels of high density lipoprotein cholesterol (HDL-C), all contribute to the pathophysiology of pre-eclampsia by causing endothelial damage through an oxidative stress mechanism in the arterial wall.[10] Therefore, early pregnancy lipid level testing may be a method to identify pregnant women at risk for pre-eclampsia. As a result, the objective of our study is to determine the serum uric acid level in preeclamptic women, compare it to the level in normal pregnant women, and analyze the diagnostic value of serum uric acid in pre-eclampsia. Additionally, our study compares pre-eclamptic women to healthy pregnant women in terms of lipid parameter alterations.

MATERIALSANDMETHODS

Study Area: This study will be conducted in department of Biochemistry, in association with obstetrics and gynecology department, Rama Medical College Hospital & Research Centre. Sample from IPD & OPD of Obstetrics and Gynaecology department Rama Medical College Hospital will be collected.

Study Period: This study was conducted from April 2022 to April 2023.

Study Design: This was a Case -Control Study

Study Subjects: The study population includes 110 subjects attending both outpatients and inpatients department of Rama Medical College & Research Centre.

They were divided into 2 groups:-

Case:55 known patients of Preeclampsia.

Control: 55 normal Pregnancy patients.

Inclusion Criteria

1. Primi Gravida
2. Multiple Pregnancies.
3. Females with family history of Hypertension

Exclusion Criteria

1. Females with hypertension
2. In- vitro pregnancy
3. Females on Statin Treatments
4. Subjects with Gouty Arthritis

Study Tool: A presented questionnaire based on semi constructed performa was used as study tool to collect data including basic profile of patients i.e. Name, Age, Sex, BP, Diet.

Consent: A verbal or written consent in their own native language was obtained from the patients before the sample collection.

Specimen Collection:5 ml of fasting blood sample was collected from antecubital vein into plain vial for lipid profile and uric acid from each of the subjects under all aseptic conditions after explaining the procedure to the study subjects

Specimen Processing: Blood sample was allowed to clot at room temperature for 15 minutes and serum was obtained by centrifugation at 3500 rpm (rotation per minute) for 10 minutes in the biochemistry laboratory and stored at -20℃ until assayed.The supernatant serum will be used for the analysis of serum total cholesterol, triglyceride, high density lipoprotein, low density lipoprotein, very low density lipoprotein, and uric acid level.

Investigation: In the present study the following analysis were conducted:

Blood Pressure	Systolic Blood Pressure Diastolic Blood Pressure
Lipid Profile Assay	Total Cholesterol (TC) Triglycerides (TG) High Density Lipoprotein-Cholesterol(HDL-C) Low Density Lipoprotein- Cholesterol (LDL-C) Very –Low Density Lipoprotein-Cholesterol (VLDL-C)
Other Assay	Uric Acid

Statistical Analysis

All the parameters of two groups were analyzed for mean and standard deviation. The results were expressed as Mean ± standard deviation. Data was analyzed by statistical software SPSS Version 29.0. Comparison among two groups was done by using t-Test. Pearson's correlation coefficient was used to find the correlation between Lipid profile And Blood Pressure; Uric acid And Blood Pressure.

RESULTS

The present research work included 110 subjects (55 pre-eclamptic patients and 55 normal pregnancies). Age distributions have been done to see the prevalence of preeclampsia among study subjects. Clinical data is studied to find out the age distribution of cases and controls. The observation of [Figure 1] evince a trend towards a higher prevalence of preeclampsia in the age group 20-29 years. The serum level of Uric Acid and Lipid profile (TC, TG, HDL-C, LDL-C, VLDL-C) obtain on analyzing specimens collected from study subjects are tabulated. The mean values and standard deviation of these parameters have been calculated for comparative study of preeclampsia (cases) and normal pregnancy (controls). The test of significance of these parameters between cases and

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controls was performed using student t- Test. Further, individual comparisons among groups have been done using the Pearson correlation coefficient and the linearity of the data is examined through the scatter diagram. The serum levels of different parameters of cases and controls also have been graphically represented for comparison at a glance. The graphs are plotted using mean values of all the study parameters.

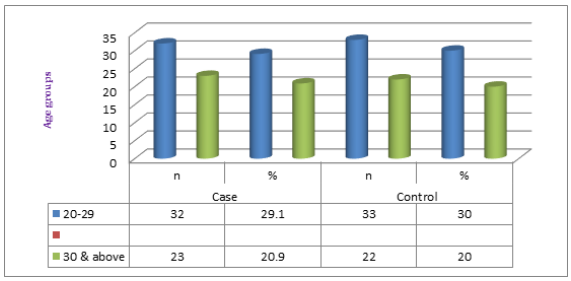

Figure 1: Shows the age (years) groups distribution of Cases and Controls.

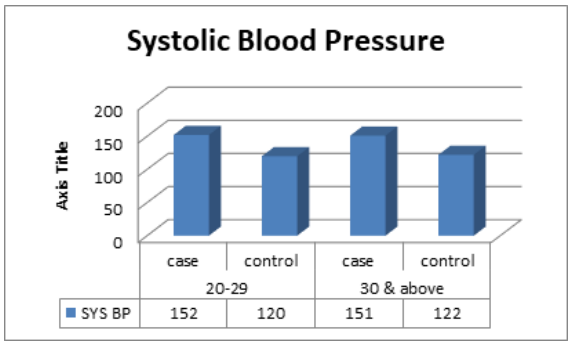

Figure 2: Shows the systolic blood pressure in different age groups.

[Figure2] shows the mean value of Systolic blood pressure in cases and controls respectively. Higher mean Systolic blood pressure (152.0±4.45) in 20-29 age group and (151.4±4.35) in 30 & above age group is recorded in cases compared to controls; and the variance in mean systolic blood pressure among the cases and controls are found to be statistically significant with p value 0.000.

The [Figure 3] shows the mean value of Diastolic blood pressure in cases and controls respectively. Higher mean Diastolic blood pressure (95.03 ± 3.58) in 20-29 age group and (94.34 ± 3.39) in 30 & above age group is recorded in cases compared to controls; and the variance in mean diastolic blood pressure among the cases and controls are found to be statistically significant with p value 0.000.

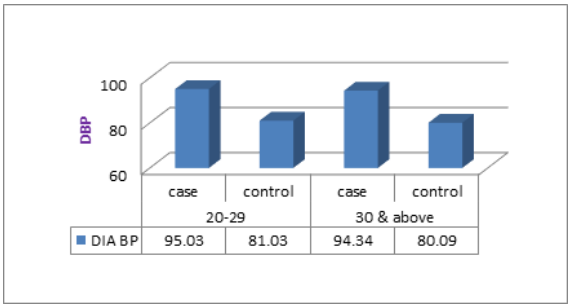

Figure 3: Shows the diastolic blood pressure in different age groups

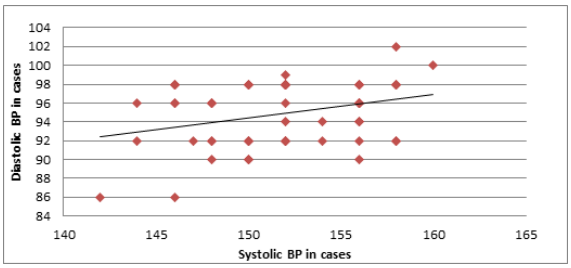

Figure 4: Shows the Table 10 & Graph 10.1: indicate positive correlation between systolic blood pressure and diastolic blood pressure in cases.('p'= .007)

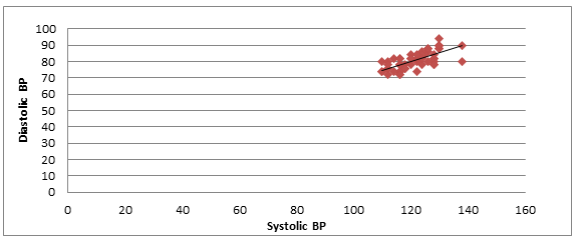

Figure 5: Shows the evident a significant positive correlation between Systolic & Diastolic blood pressure in control.('p'= .000).

Table 1: Shows the lipid profile, uric acid and its statistical significance in different age groups.

Variables	Age group	Cases Mean ± SD	Control Mean ± SD	p-value
TC	20-29	210.8 ± 42.10	164.3 ± 16.45	0.00
	30 & above	235.3 ± 46.05	165.3 ± 15.85	0.00
TG	20-29	205.31 ± 40.05	165.60 ± 15.46	0.00
	30 & above	204.60 ± 27.75	166.18 ± 15.84	0.00
HDL-c	20-29	49.40 ± 5.29	40.45 ± 5.72	0.00
	30 & above	48.86 ± 5.34	41.90 ± 5.98	0.00
LDL-c	20-29	134.06 ± 11.71	97.36 ± 10.69	0.00
	30 & above	131.26 ± 9.39	97.04 ± 8.29	0.00
VLDL-c	20-29	49.21 ± 5.66	34.90 ± 4.19	0.00
	30 & above	49.34 ± 5.94	35.22 ± 4.48	0.00
Uric Acid	20-29	8.20 ± .579	2.95 ± 1.14	0.00
	30 & above	8.18 ± .677	3.27 ± .599	0.00

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Table 2: Pearson Correlation between systolic & diastolic Blood Pressure and Lipid Profile & Uric Acid.

Lab variables	SBP	Pearson Correlation 'r'	p-value	DBP	Pearson Correlation 'r'	p-value
TC	Cases(50)	0.179	0.192	0.138	0.316	0.00
	Controls(50)	0.092	0.506	0.073	0.595	0.00
TG	Cases(50)	0.023	0.867	0.094	0.496	0.00
	Controls(50)	0.095	0.492	0.111	0.418	0.00
HDL-c	Cases(50)	0.106	0.441	0.019	0.893	0.00
	Controls(50)	0.021	0.881	0.057	0.681	0.00
LDL-c	Cases(50)	0.079	0.567	0.016	0.905	0.00
	Controls(50)	0.061	0.658	0.184	0.178	0.00
VLDL-c	Cases(50)	0.005	0.972	0.120	0.381	0.00
	Controls(50)	0.161	0.241	0.054	0.695	0.00
Uric Acid	Cases(50)	0.052	0.706	0.205	0.130	0.00
	Controls(50)	0.220	0.107	0.480**	0.000	0.00

DISCUSSION

The present study was conducted at Rama Medical College, Hospital & Research Centre, Kanpur, Uttar Pradesh, India with the objective to Associate the role of serum lipid profile & uric acid level in preeclampsia and compare it in the normal pregnancy. In pre-eclampsia the glomerular barrier is certainly altered and there is an increased excretion of protein including albumin. When total protein excreted exceeds 1g/24 hrs or +1 by dipstick, tubular protein reabsorption will be saturated and individual proteins excretion rates will be related to their molecular weights. Duckitt et al,[11] obtained similar finding in their study. We selected nullipara women for the present study as nulliparity is not only have high risk of pre-eclampsia but is the most common maternal risk factor which can easily be assessed by history. Although age groups presented with high prevalence of preeclampsia,our study indicates that there is a trend towards a higher prevalence of preeclampsia in the age group 20-29 years [Figure 1]. It was found that levels of Total Cholesterol, High Density Lipoprotein, Low Density Lipoprotein, Very Low Density Lipoprotein were statistically significant at p<.000 level of significance in both groups. It was also observed that Triglycerides and Uric acid levels were found raised in both the groups, statistically significant at p<.000 level of significance. Wladimiroff et al,[12] obtained similar findings for lipid profile in pre-eclampsia and normotensive pregnancies. In the present study, the mean ± SD levels of Serum Total Cholesterol, Triglycerides, Low Density Lipoprotein were significantly higher in cases than that of controls Serum TC, TG, LDL-C, shows a statistically significance between cases and controls. Similar finding were reported by Sharma P et al,[13]Bishnoi et al,[14]Sridhara et al.[15]Enquobahrie et al,[16] in their respective study concluded that hypertriglyceridemia is probably a consequence of competition between chylomicron and very low- density lipoprotein (VLDL) cholesterol for the lipoprotein lipase. High blood pressure & high cholesterol have complicated relationship. When human body can not clear cholesterol from the blood stream, So in the that situation excess cholesterol gets deposit along the artery walls, due to which arteries become stiff and narrow with plaque and it's become difficult for the heart to pump blood through it easily. The principle modulator of this hypertriglyceridemia is oestrogen as pregnancy is associated with hyperoesterogenaemia. Oestrogen induces hepatic biosynthesis of endogenous trigylcerides which is carried by VLDL. This process may be modulated by hyper insulinism found in pregnancy. Serum triglyceride concentration increases much more significantly in pre- eclamptic pregnancy. Our study also corroborated with the finding of Equobohrie et al,[16] and Cekmen et al.[17] The association between dyslipidemia and risk of pre-eclampsia is biologically possible and explained by 3 hypotheses. First, elevated plasma lipids and lipoprotein induced endotheial dysfunction secondary to oxidative stress. It also impairs trophoblastic invasion of maternal blood vessels, thus contributing to a cascade of Pathophysiological events that leads to development of pre-eclampsia. Second mechanism is the pathologic process of pre-eclampsia via dysregulation of lipoprotein lipase resulting in a dyslipidemic lipid profile. Third possible mechanism may be via the metabolic syndrome. Metabolic characteristics of "insulin resistance syndrome" namely hyperinsulinemia and hyperuricemia are also present in pre-eclampsia. In the earlier time, uric acid was only considered as being the cause of gout; however, it is now increasingly thought of as a factor that can alter endothelial cell function. Hence, intrest has been renewed in uric acid as a possible indicator of maternal response in pre-eclampsia also. In our study uric acid levels were not only found raised in both groups but they were highly significant (p<.000) level significant. Alavi et al,[18] and Litwinska et al,[19] have made similar observation of higher levels of uric acid in serum of pre-eclamptic women. From our study, it is observed that preeclampsia patients having elevated Total Cholesterol, Triglycerides, LDL-C, HDL-C, VLDL-C, and Uric Acid, which also shows positive correlation with blood pressure. Our finding are in consistent with the figures mentioned in local as well as international literatures of authors, Bishnoi et al,[14]Sridhara et al,[15]Ghaffar et al,[20] find similar

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find in their respective studies. Increased uric acid concentrations may be a part of the pathogenesis of the clinical syndrome rather than a marker of Pre-eclampsia. Alternatively, production of uric acid might increase in Pre-Eclamptic women as a part of an appropriate response to inflammation. The known role of uric acid as a scavenger of oxygen free radicals support this theory. AC Martin et al.[21] Many studies have shown the difference for serum uric acid between the normal pregnant women and those with signs of preeclampsia. It was demonstrated that preeclamptic patients with increased serum uric acid values had to undergo induce labour due to their increased risk of complications. Alavi et al.[18] Decreased renal clearance and renal reabsorbtion owing to decreased Glomerular Filtration Rate, along with placental hypoxia and placental cell destruction, both being the source of purine for production of uric acid by Xanthine Oxidase, explains the presence of hyperuricemia in Pre-eclampsia. Many studies has shown that uric acid increases the Blood Pressure by increasing salt sensitivity and vascular smooth muscle proliferation. In preeclampsia due to placental hypoxia, degree of placental cell destruction increases, which are rich source of purine for the production of uric acid by xanthine oxidase. This could also be the reason of increased uric acid. Our study is limited by the limited number of patients attending only Rama Medical College Hospital and Research Centre, Kanpur U.P and also due to limited period. Additionally, the list of potential cofounders for the above biochemical parameters which need to be studied in detail and requires large population to reflect the correlation correctly.

CONCLUSION

Assessment of serum lipids and uric acid is of greatest importance in all pre-eclampsia patients, as well as in normal pregnancy because pregnancy is associated with hyperlipidemia. But abnormal increase in triglycerides, LDL, VLDL and total cholesterol contributes to promotion of oxidative stress and vascular dysfunction leading to pregnancy induced hypertension.

From this study, it can be concluded that preeclampsia is most common in early aged and low economic areas due to the protein deficient diet. So, clinicians should evaluate serum lipid profile and uric acid levels in pregnant women during early antenatal visits which will be helpful in early detection of preeclampsia and preventing obstetric complications like eclampsia, ante- partum hemorrhage, preterm labour associated with preeclampsia.

On the other hand, this study would however give the better answer to questions, when applied on large scale of subjects and also long term follow-up to see the changes in biochemical parameters.

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