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Dr. Syeda Sarah
Senior Resident, Department of Obstetrics and Gynecology, Gadag Institute of Medical Sciences, Gadag, Karnataka, India

Dr. Amruta S Patil
Assistant Professor, Department of Obstetrics and Gynecology, Gadag Institute of Medical Sciences, Gadag, Karnataka, India

Correspondence
Dr. Amruta S Patil
Assistant Professor, Department of Obstetrics and Gynecology, Gadag Institute of Medical Sciences, Gadag, Karnataka, India

Serum LDH and Uric acid in preeclampsia versus normotensive pregnant women: A comparative study

Dr. Syeda Sarah and Dr. Amruta S Patil

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Abstract
Background: This study was done to compare the serum levels of Lactate Dehydrogenase (LDH) and Uric acid (UA) in preeclampsia versus normotensive pregnant woman and correlate their levels with the severity of the disease.
Materials and Methods: 50 antenatal patients having preeclampsia and equal no. of normotensive patients were chosen. About 3 mL of blood was drawn under aseptic precautions from selected subjects in a plain vial for serum. Serum was separated by centrifugation and used for estimation of serum levels of LDH and UA.
Results: We have observed significant difference in serum LDH and UA in hypertensive group patients in comparison with normotensive patients.
Conclusion: We concluded in this study that serum LDH and UA are reliable and inexpensive markers to predict severity and maternal and foetal outcome in preeclampsia.

Keywords: LDH, Uric acid, preeclampsia, hypertensive disorders, abruption, normotensive women

Introduction
Pregnancy is a physiological state associated with many alterations in metabolic, biochemical, physiological, haematological and immunological processes. If there are no complications, all these changes are reversible following a few days to a few months after delivery [1, 2, 3].
Hypertension during pregnancy is a major health problem. It is one of the leading causes of perinatal morbidity and mortality. Preeclampsia (PE) is a theoretical disease with a pathogenesis that is not clearly understood yet. Lately, vascular system pathology and vasoconstriction have been blamed as causes for preeclampsia [4, 5].
During early pregnancy, there is increased body fat accumulation associated with increased lipogenesis, while in late pregnancy there is accelerated breakdown of fat depots which play an important role in foetal development.
Early pregnancy dyslipidaemia is associated with an increased risk of preeclampsia. Several studies have been carried out till date to understand the pathophysiological basis of this disease. But still the exact pathophysiology of this disease is not known.
Lactate Dehydrogenase (LDH) is mainly an intracellular enzyme. It is responsible for interconversion of pyruvate and lactate in the cells. Its levels are several times greater inside the cells than in the plasma.
Uric Acid (UA) is an end product of purine metabolism. It is filtrated through the glomeruli and almost completely reabsorbed in the Proximal Convoluted Tubules (PCT) by both active and passive carrier-mediated processes.
It is also actively secreted into the tubules; 85% of total excreted UA is derived by tubular secretion. Hyperuricaemia is found to be one of the earliest laboratory manifestations of preeclampsia [6, 7, 8, 9].

Materials and Methods
After approval from the Institutional Ethical Committee and informed written consent, this prospective randomised study was carried out; 50 patients, women satisfying the inclusion and exclusion criteria were recruited from antenatal & labourward of Gadag institute of medical sciences gadag, Karnataka, from August 2018 to August 2019.
Study Group: Preeclamptic antenatal patients (n = 50),
Group B: Normotensive antenatal patients (n = 50).

Inclusion criteria

1. Gestational age > 20 weeks.
2. Primi/Multigravida.
3. Antenatal patients of age 18 - 35 yrs.
4. All antenatal patients are normotensive as well as hypertensive, which do not fall under exclusion criteria.

Exclusion criteria

1. Patients with all known renal disease, diabetes, hepatic dysfunction, alcoholism, dyslipidaemia, RH negative blood group and cardiac diseases.
2. Preexisting hypertension before pregnancy.
3. Multiple pregnancy.

Collection of Blood Samples

About 3 mL of blood was drawn under aseptic precautions from selected subjects in a plain vial for serum. Serum was separated by centrifugation and used for estimation of serum levels of LDH and UA. Values were calculated as mean ± SD and the statistical analysis was done using GraphPad Prism V. 6.0 software. Student's unpaired t-test was used for comparison between two groups. The p-value of less than 0.05 was considered as statistically significant.

Results

Table 1: Comparison of LDH, UA and ALP

Variables	Cases (Pre eclampsia) Mean ±SD	Controls Mean ±SD	P value*
LDH	667.9 ± 31.0	324.4 ± 82.0	0.001
UA	4.78 ± 1.1	4.1 ± 0.6	0.002

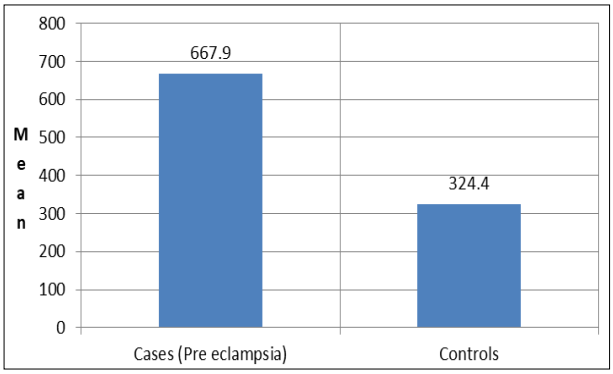

Fig 1: LDH

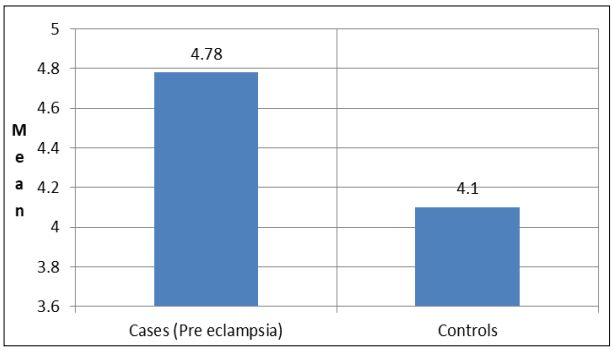

Fig 2: UA

The mean LDH is high among cases (667.9) compared to controls (324.4) and this difference is statistically significant
The mean UA is high among cases (4.78) compared to controls (4.10) and this difference is statistically significant

Table 2: LDH levels in foetal outcome (among pre eclampsia cases)

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
LDH	Pre term	13	651.08	247.248	68.574	501.67	800.49	421	1254
	Term	28	628.46	333.080	62.946	499.31	757.62	231	2000
	IUD	3	924.33	197.034	113.758	434.87	1413.79	743	1134
	IUGR	5	748.60	397.168	177.619	255.45	1241.75	234	1298

P value – 0.43

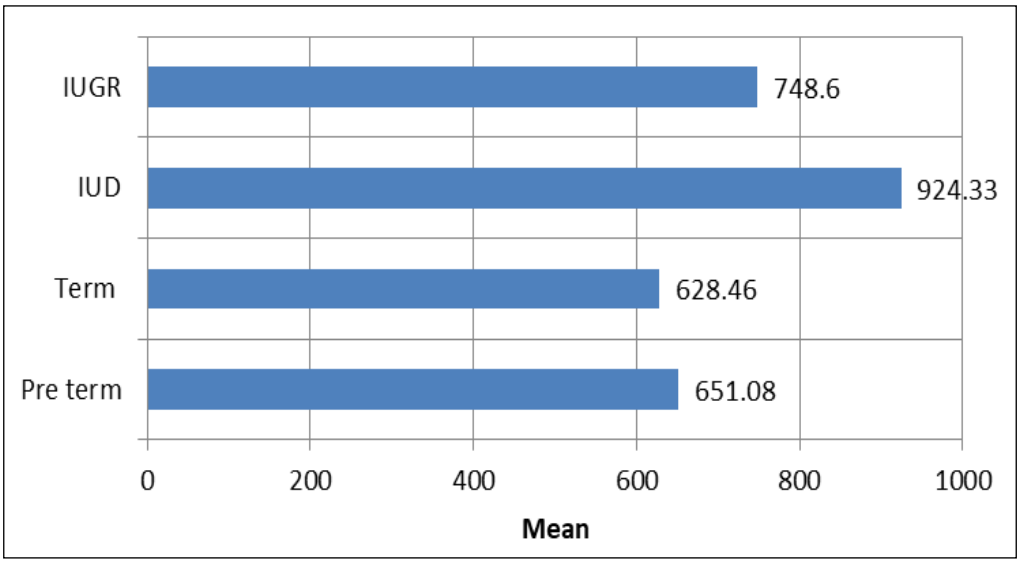

Fig 3: LDH in foetal outcome

The analysis of LDH levels among Pre eclamptic cases revealed that, The mean LDH was high among IUD babies (924.33) followed by IUGR (748.60), Pre term babies (651.08) and Term babies (628.46)

Table 3: UA levels in foetal outcome (among pre eclampsia cases)

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
UA	Pre term	13	4.753846	.9207021	.2553568	4.197471	5.310221	3.2000	6.9000
	Term	28	4.675000	1.0193044	.1926304	4.279755	5.070245	3.2000	7.9000
	IUD	3	6.400000	2.0420578	1.1789826	1.327247	11.472753	4.1000	8.0000
	IUGR	5	4.440000	1.4380542	.6431174	2.654420	6.225580	3.0000	6.8000

P value – 0.08 (ANOVA)

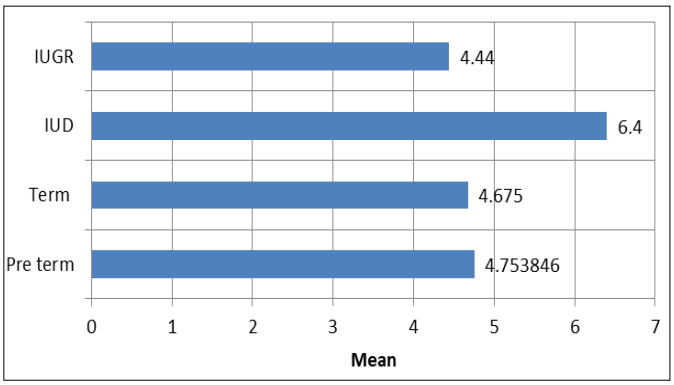

Fig 4: UA in Foetal outcome

The analysis of UA levels among Pre eclamptic cases revealed that, The mean UA was high among IUD babies (6.4) followed by Pre Term babies (4.7), Term babies (4.6), and IUGR (4.4).

Table 4: LDH, And UA levels in maternal complications (among pre eclampsia cases)

	Maternal complications	N	Mean	Std. Deviation	P value*
LDH	Yes	7	1006.57	293.621	0.001
	No	43	612.35	279.424	
UA	Yes	7	5.857143	1.4339423	0.006
	No	43	4.606977	.9989031	

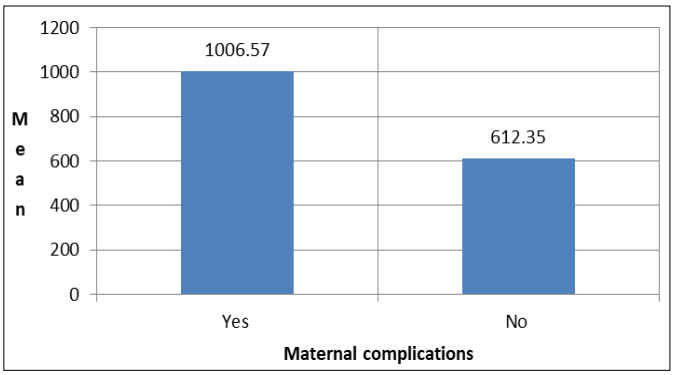

Fig 5: LDH in Maternal complications

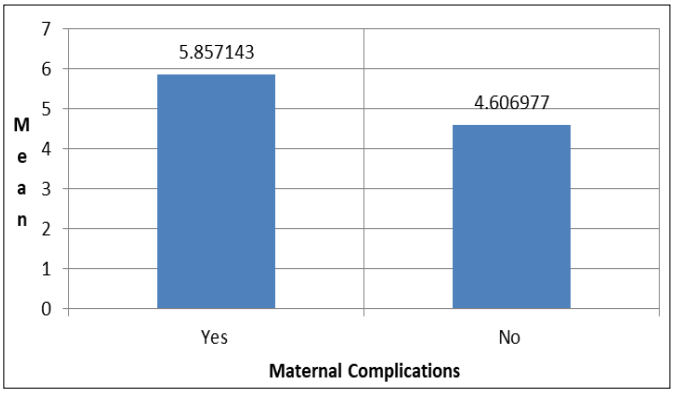

Fig 6: UA in Maternal Complications

The mean LDH level was high among cases with maternal complications (1006.5) compared to cases without maternal complications (612.35) and this difference is found to be statistically significant

The mean UA level was high among cases with maternal complications (5.8) compared to cases without maternal complications (4.6) and this difference is found to be statistically significant

Discussion

Preeclampsia is a common medical complication of pregnancy. In India, the incidence of preeclampsia is reported to be 8% - 10% of the pregnancies. It contributes significantly to maternal and foetal mortality and morbidity. Preeclampsia is a multisystem disorder characterised by hypertension to the extent of 140/90 mmHg or more, proteinuria (≥ 300 mg/day) and oedema induced by pregnancy after 20th week. Without intervention preeclampsia progresses to eclampsia; this is characterised by malignant hypertension and epileptiform convulsions requiring emergency caesarean section. Many theories have suggested that endothelial dysfunction caused by factors released from ischaemic placenta may be a causative factor for disease pathogenesis. In our study, we have observed a significant increase in serum LDH and uric acid level in women with hypertension in comparison with normotensive women.

These findings were in accordance with a study done by Qublan *et al.* and Kozic *et al.* [1, 2]. They concluded that serum LDH can be a useful marker for the prediction of adverse outcome of pregnancy in severe preeclampsia. Serum LDH is also found to be a useful predictor of birth of small for gestational age infants in preeclamptic pregnancy. Previous studies demonstrated the importance of amniotic serum LDH level for the prediction of foetal growth restriction. It is found that LDH-A (4) isoenzyme is immunolocalised primarily in the foetal endothelial cells, while LDH-B (4) isoenzyme is predominantly present in syncytiotrophoblasts.

The LDH-A (4) isoenzyme activity increased approximately by 1.6-fold in preeclampsia when compared with normal pregnancy. This may also suggest that endothelial dysfunction present at uteroplacental vessels can lead to hypoperfusion to the growing foetus and may lead to elevation of LDH isoform [15]. In our study, mean levels of serum LDH were significantly higher in Group A when compared with Group B ($p < 0.05$). These findings indicate that increased levels of these parameters are seen as the disease severity increases.

Hypertensive disorders of pregnancy are commonly associated with a decrease in renal function due to damage done by hypertension and widespread endothelial dysfunction. Glomeruli undergo structural changes with pronounced endothelial cell swelling, vacuolisation and hypertrophy of the cytoplasmic organelles known as “glomerular endotheliosis.” The net effects have reduced renal blood flow, reduced GFR, impaired tubular reabsorption and secretory function. In our study, we found that the mean serum UA levels were significantly higher in cases when compared with controls. This finding is in accordance with the study done by Punthumapol *et al.* [10].

It is found that estimation of serum UA is as important as proteinuria in identifying the risk of renal involvement and foetal compromise. Maternal hyperuricaemia is found to be a strong predictor of maternal disease progression and foetal outcome.

Thus, it can be used as a useful and inexpensive marker for predicting disease severity, renal function status and foetal growth retardation in women presenting with HDP. In our study, mean levels of serum LDH and UA were significantly higher in Group A when compared with Group B ($p< 0.05$). These findings indicate that increased levels of these parameters are seen as the disease severity increases.

Conclusion

We conclude that serum LDH and UA are reliable and inexpensive markers to predict severity and outcome of hypertensive disorders of pregnancy.

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