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Research Article

Serial Estimation and Comparison of Serum LDH and Serum Uric Acid Levels in Hypertensive Versus Normotensive Pregnant Woman and its Fetomaternal Outcome in a Tertiary Care Hospital

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Abstract

Introduction: Hypertensive disorder in pregnancy is 3rd cause of maternal mortality, one of the major causes of maternal morbidity and also responsible for perinatal death resulting from prematurity and IUGR [1].

Aims: To estimate the serial serum uric acid and serial serum LDH level in women having hypertensive disorder of pregnancy (case) after 20 weeks of pregnancy till term to estimate the serial serum level of uric acid and serial serum LDH in normotensive pregnant women (control) after 20 weeks of pregnancy till term.

Materials and Methods: It was a comparative study conducted in the dept of OBG at ESIPGIMSR, ESIC Medical college, Joka, Kolkata for period of 18 month 124 patients were included.

Results: Patients were belong to 21-39 years. Primigravida were 53%. Multigravida were 42%. 70 patients were delivered by caesarean section.

Conclusion: Serum LDH and S uric acid values can be used as prognostic factor.

Keywords: *Serum Lactate Dehydrogenase (LDH); Serum Uric Acid (U.A); Pre-Eclampsia; Gestational Hypertension; Caesarean Section*

Introduction

Hypertensive disorder is one of the commonest medical disorders in pregnancy and it is one of the major causes of maternal morbidity and also responsible for perinatal death resulting from prematurity and IUGR [1]. Hypertension associated with proteinuria with or without pathological oedema, beyond the 20th weeks of gestation in previous normotensive women is known as pre-eclampsia. Preeclampsia affects approximately of 5 - 7% of all pregnancies [2]. It is a multisystemic disease with unknown aetiology. Generalized vasospasm is the main pathology [3]. Preeclampsia is one of most common cause of maternal death in developed country) [4]. If LDH >800 associated with more complication [5]. So, serum LDH level can be used to assess the severity of the disease [6]. Serum uric acid is an end product of purine metabolism [6]. Over time uric acid uptake into vascular smooth muscles cells causes cellular proliferation and secondary arteriosclerosis that impairs pressure natriuresis and causing sodium sensitive hypertension [7]. Hyper-uricemia has found to be an early identification of the patients at risk, this would help in the development of preventive care or early intervention thus reducing the associated complications earliest than the laboratory manifestation in Pre-eclampsia and its increasing level shows serious damage of kidney function. These are the possible pathogenesis for preeclampsia [7].

Aim of the Study

Aim of the study is to estimate the serial serum uric acid and serum LDH level in women having hypertensive disorder of pregnancy (case) and normotensive after 20 weeks of pregnancy till term and to compare maternal and perinatal outcome in relation to abnormal serum levels of LDH and uric acid.

Methodology

Inclusion criteria

All pregnant women of age 17 - 45 years irrespective of parity with beyond 20 weeks of gestation, with a diagnosis of hypertension.

Exclusion criteria

Women with any pre-existing medical disorder such as renal disease, thyroid disorder, diabetics, hepatitis, Dyslipidaemia, cardiovascular disorder, malignancy.

Sample size for the proposed study is calculated based on the formula for study involving two proportions as per following formula:

Sample size = n (for each group) = (Zα)2x {(SD1)2+(SD2)2} d2

Patients were divided into 2 groups (normotensive - control and hypertensive - cases) and 124 pregnant women were conveniently selected as per inclusion and exclusion criteria, 62 patients in each group.

Maternal outcome will be assessed in the form of eclampsia, HELLP syndrome, mode of delivery.

Fetal outcome will be assessed in the form of IUGR Apgar score, NICU admission.

Statistical analysis

Data were entered into a Microsoft excel spreadsheet and then analysed by SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and Graph Pad Prism version 5. Data had been summarized as mean and standard deviation for numerical variables and percentages.

Results

Maternal Complication	Hypertensive	Normotensive	Total
Eclampsia	5	2	7
Row %	71.4	28.6	100.0
Col %	8.1	3.2	5.6
IUGR	7	2	9
Row %	77.8	22.2	100.0
Col %	11.3	3.2	7.3
No	35	56	91
Row %	38.5	61.5	100.0
Col %	56.5	90.3	73.4
Placenta Previa	3	0	3
Row %	100.0	0.0	100.0
Col %	4.8	0.0	2.4
PPH	6	2	8

Row %	75.0	25.0	100.0
Col %	9.7	3.2	6.5
PROM	2	0	2
Row %	100.0	0.0	100.0
Col %	3.2	0.0	1.6
Severe Preeclampsia	4	0	4
Row %	100.0	0.0	100.0
Col %	6.5	0.0	3.2
Total	62	62	124
Row %	50.0	50.0	100.0
Col %	100.0	100.0	100.0

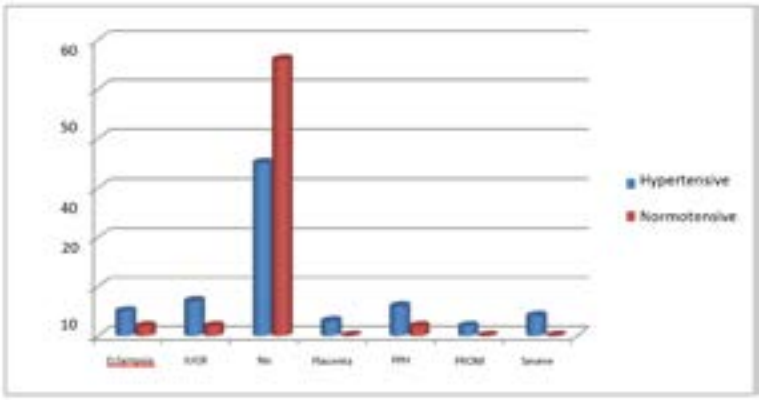

Table 1: *Chi-square value: 19.9096; df: 6 p-value: 0.0029, in hypertensive, 7 (11.3%) patients had IUGR. In normotensive, 2 (3.2%) patients had IUGR. Association of maternal complication with group was statistically significant (p = 0.0029).*

	Group		
MOD	**Hypertensive**	**Normotensive**	**Total**
LUCS	42	4	46
Row %	91.3	8.7	100.0
Col %	67.7	6.5	37.1
NVD	20	58	78
Row %	25.6	74.4	100.0
Col %	32.3	93.5	62.9
Total	62	62	124
Row %	50.0	50.0	100.0
Col %	100.0	100.0	100.0

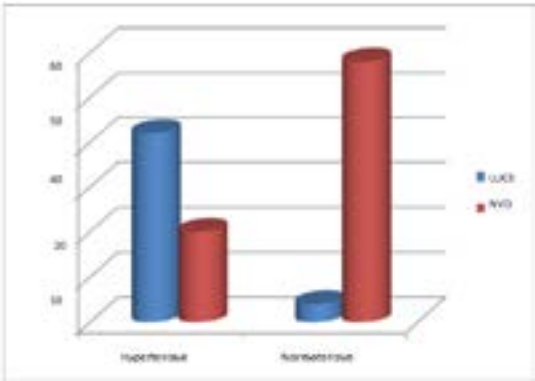

Table 2: *Association between MOD: Group.*

Chi-square value: 49.9041; p-value: < 0.0001. Odds ratio: 30.4500 (9.6935, 95.6521). In hypertensive, 42 (67.7%) patients had LSCS and 20 (32.3%) patients had NVD MOD. In normotensive, 4 (6.5%) patients had LSCS and 58 (93.5%) patients had NVD MOD. Association of MOD with group was statistically significant (p < 0.0001).

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Neonatal Complication	**Hypertensive**	**Normotensive**	**Total**
Birth Asphyxia	5	4	9
Row %	55.6	44.4	100.0
Col %	8.1	6.5	7.3
Mas	5	8	13
Row %	38.5	61.5	100.0
Col %	8.1	12.9	10.5
Nicu Admission	5	7	12
Row %	41.7	58.3	100.0
Col %	8.1	11.3	9.7
No	31	42	73
Row %	42.5	57.5	100.0
Col %	50.0	67.7	58.9
Sepsis	14	1	15
Row %	93.3	6.7	100.0
Col %	22.6	1.6	12.1
Sepsis+Neonatal Death	2	0	2
Row %	100.0	0.0	100.0
Col %	3.2	0.0	1.6
Total	62	62	124
Row %	50.0	50.0	100.0
Col %	100.0	100.0	100.0

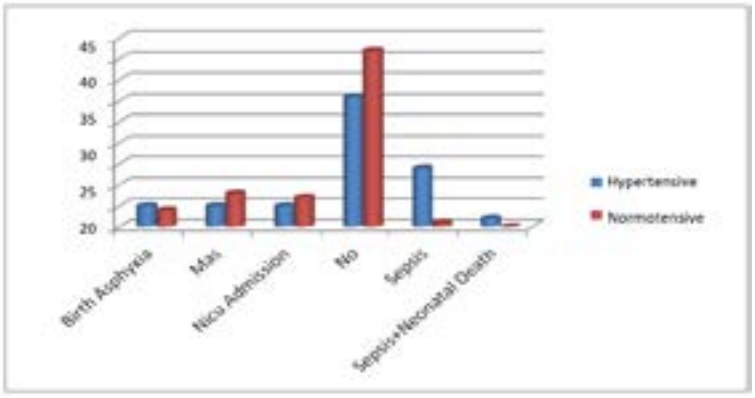

Table 3: *Association between neonatal complication: Group.*

Chi-square value: 16.0610; df: 5 p-value: 0.0067. In hypertensive, 5 (8.1%) patients had birth asphyxia, 5 (8.1%) had MAS, 5 (8.1%), had NICU admission, 14 (22.6%) had sepsis and 2 (3.2%) had sepsis + neonatal complication. In normotensive, 4 (6.5%) patients had birth asphyxia, 8 (12.9%) had MAS, 7 (11.3%) had NICU admission and 1 (1.6%) had sepsis + neonatal complication. Association of neonatal complication with group was statistically significant (p = 0.0067).

		NO.	Mean	SD	Min	Max	Median	P-value	T-value
LDH	Hypertensive	62	524.41	126.04	268.00	1241.00	527.00	0.0254	1.434
	Normotensive	62	491.32	130.86	276.00	997.00	483.50		

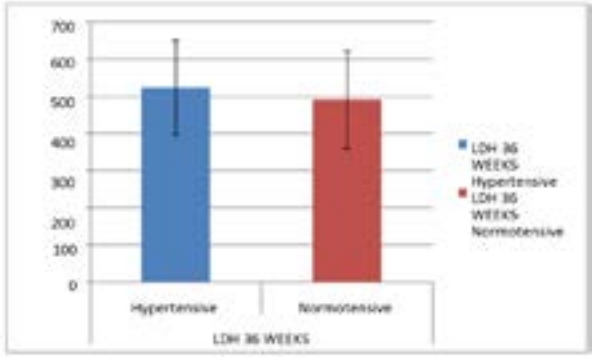

Table 4: *Distribution of mean LDH 36 weeks.*

In hypertensive, the mean LDH of patients was 524.4194 ± 126.0448. In normotensive, the mean LDH was 491.3226 ± 130.8643. Distribution of mean LDH 36 WEEKS with group was statistically significant (p = 0.02540).

		No.	Mean	SD	Min	Max	Median	P-value	T-value
Uric acid 36 weeks	Hypertensive	62	5.72	1.14	3.50	8.80	5.60	0.0083	1.6178
	Normotensive	62	5.09	1.16	3.10	8.20	5.60		

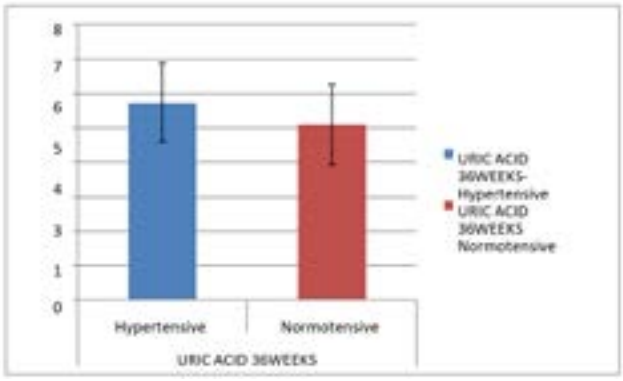

Table 5: *Distribution of mean uric acid at 36 weeks: Group.*

In hypertensive, the mean uric acid at 36 weeks of patients was 5.72 ± 1.14. In normotensive, the mean was 5.09 ± 1.16. Distribution of mean uric acid with group was statistically significant (p = 0.0083).

		No.	Mean	SD	Min	Max	Median	P-value	T-value
SBP	Hypertensive	62	147.12	8.72	120.00	168.00	148.00	<0.0001	10.936
	Normotensive	62	129.33	9.37	106.00	160.00	128.00		

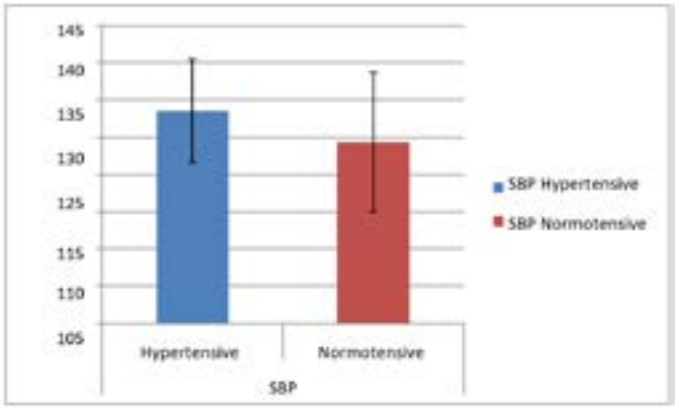

Table 6: *Distribution of mean SBP in study group.*

In hypertensive, the mean SBP (mean ± s.d.) of patients was 147.1290 ± 8.7262. In normotensive, the mean SBP (mean ± s.d.) of patients was 129.3387 ± 9.3755. Distribution of mean SBP with group was statistically significant (p<0.0001).

		No.	Mean	SD	Min	Max	Median	P- value	T- value
DBP	Hypertensive	62	90.16	3.26	86.00	98.00	90.00	<0.0001	2.8271
	Normotensive	62	83.29	7.66	72.00	110.00	83.00		

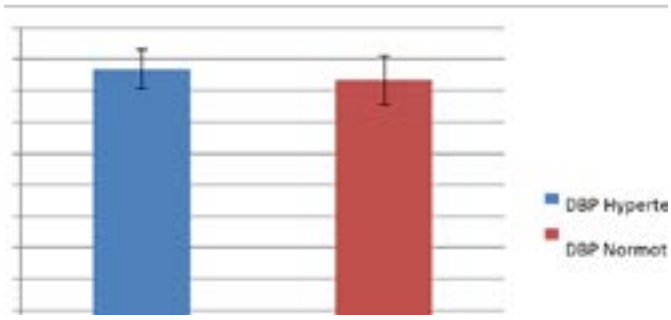

Table 7: *Distribution of mean DBP in study group.*

In hypertensive, the mean DBP (mean ± SD) of patients was 90.1613 ± 3.2653. In normotensive, the mean DBP (mean ± SD) of patients was 83.2903 ± 7.6660. Distribution of mean DBP with group was statistically significant (p < 0.0001).

		No.	Mean	SD	Min	Max	Median	P- value
LDH 36 weeks	Eclampsia	5	631.80	361.33	394.00	1241.00	418.00	0.0351
	IUGR	7	546.71	69.33	453.00	612.00	596.00	
	No	35	519.20	79.35	367.00	657.00	534.00	
	Placenta Previa	3	487.33	112.63	402.00	615.00	445.00	
	PPH	6	475.50	109.39	268.00	560.00	505.50	
	PROM	2	512.00	124.45	424.00	600.00	512.00	
	Severe preeclampsia	4	604.25	83.15	429.00	584.00	502.00	

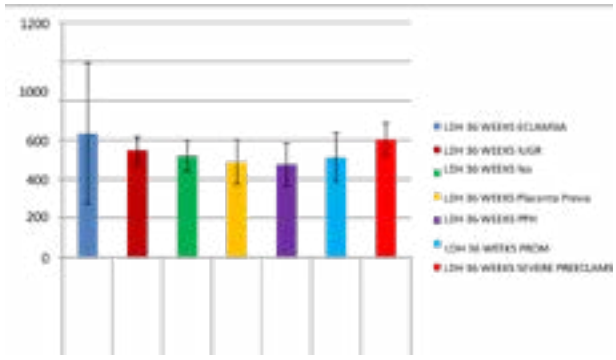

Table 8: *Distribution of mean LDH at 36 weeks: Maternal complication.*

In eclampsia the mean LDH 36 weeks of patients was 631.8000 ± 361.33. In IUGR, the mean LDH 36 weeks was 546.7143 ± 69.3318. In NICU, the mean LDH of patients was 519.20 ± 79.3510. In placenta previa the mean was 487.3333 ± 112.6336. In PPH, the mean LDH 36 weeks (mean ± SD) of patients was 475.5000 ± 109.3942. In PROM, the mean was 512.00 ± 124.4508. In severe preeclampsia the mean was 604.2500 ± 83.1560. Distribution of mean LDH 36 weeks with maternal complication was statistically significant.

		No.	Mean	SD	Min	Max	Median	P-value
LDH 36 weeks	Birth Asphyxia	5	439.20	115.72	268.00	546.00	445.00	0.0399
	MAS	5	477.00	59.00	424.00	568.00	480.00	
	NICU admission	5	507.60	102.53	444.00	688.00	480.00	
	No	31	560.41	148.98	400.00	1241.00	544.00	
	Sepsis	14	510.71	81.47	367.00	600.00	547.00	
	Sepsis+Neonatal Death	2	536.00	.0000	436.00	436.00	436.00	

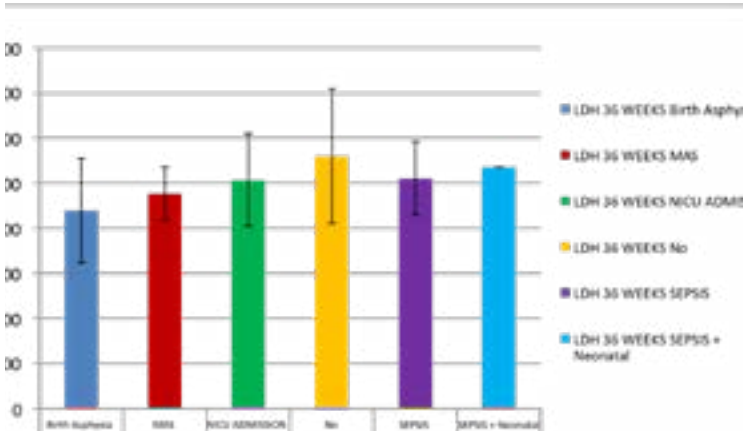

Table 9: *Distribution of mean LDH 36 weeks: Neonatal complication.*

The mean LDH at 36 weeks with birth asphyxia was 439.20 ± 115.7225, In MAS, the mean was 477.00 ± 59.0000, NICU admission, the mean was 507.6000 ± 102.5319. In sepsis, the mean LDH 36 weeks was 510.7143 ± 81.4781. In sepsis + neonatal death, the mean LDH 36 Weeks (mean ± SD) of patients was 536.0000 ± .0000. Distribution of mean LDH 36 weeks with neonatal complication was statistically significant.

		No	Mean	SD	Min	Max	Median	P- value
Uric acid 32 weeks	Birth asphyxia	2	4.42	.7190	3.60	5.50	4.20	0.0465
	NICU admission	2	4.34	.9685	3.00	5.70	4.20	

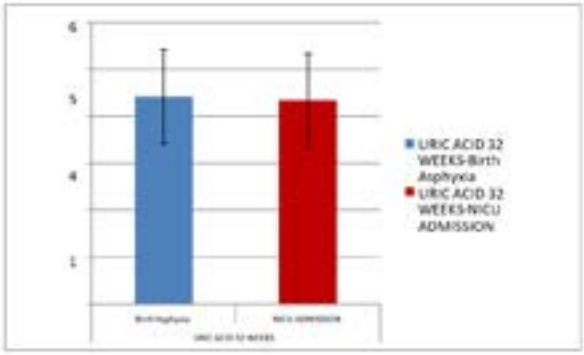

Table 10: *Distribution of mean uric acid 32 at weeks: Neonatal complication.*

In birth asphyxia, the mean Uric Acid 32 Weeks was 4.4200 ± .7190. In NICU admission, the mean uric acid 32 weeks was 4.3400 ± .9685. Distribution of mean uric acid with neonatal complication was statistically significant (p = 0.0465).

		No.	Mean	SD	Min	Max	Median	P- value
Uric acid 36 weeks	Birth Asphyxia	5	5.40	.45	5.00	6.10	5.20	0.0464
	MAS	5	5.76	.68	5.00	6.80	5.60	
	NICU admission	5	5.64	1.32	4.00	7.60	5.80	
	No	31	5.09	1.35	3.50	8.80	5.90	
	Sepsis	14	5.78	1.01	4.00	7.20	5.80	
	Sepsis + Neonatal Death	2	5.30	.42	5.00	5.60	5.30	

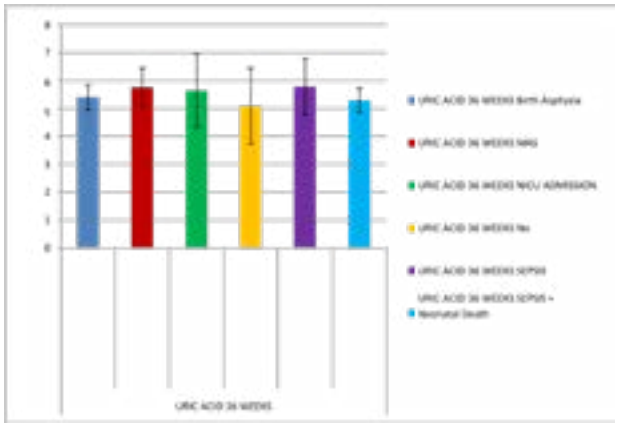

Table 11: *Distribution of mean uric acid at 36 weeks: Neonatal complication.*

In birth asphyxia, the mean Uric Acid of patients was 5.4000 ± .4528. In MAS, the mean was 5.7600 ± .6841, In NICU admission, the mean was 5.6400 ± 1.3221. In sepsis, the mean was 5.7857 ± 1.0129. In sepsis + neonatal death, the mean uric acid of patients was 5.3000 ± .4243. Distribution of mean uric acid with neonatal complication was statistically significant (p = 0.0464).

In normotensive

		No.	Mean	SD	Min	Max	Median	P-value
LDH 36 weeks	Eclampsia	2	590.00	347.89	344.00	836.00	590.00	0.03881
	IUGR	2	583.00	4.24	580.00	586.00	583.00	
	No	56	487.82	125.74	276.00	997.00	483.50	
	PPH	2	399.00	1.41	398.00	400.00	399.00	

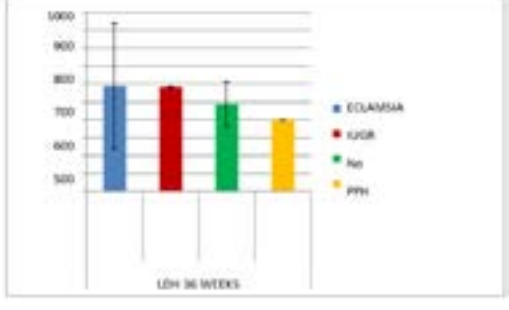

Table 12: *Distribution of mean LDH 36 at weeks: Maternal complication.*

In eclampsia, the mean uric acid of patients was 590.00 ± 347.89. In IUGR, the mean was 583.00 ± 4.24. In PPH, the mean was 487.82 ± 125.74. Distribution of mean LDH 36 weeks with maternal complication was statistically significant (p = 0.03881).

		No.	Mean	SD	Min	Max	Median	P- value
Uric acid 36 weeks	Eclampsia	2	6.5500	.2121	6.40	6.70	6.55	0.02582
	IUGR	2	6.5000	.7071	6.00	7.00	6.50	
	No	56	5.3071	1.1467	3.10	8.20	5.55	
	PPH	2	5.5000	2.1213	4.00	7.00	5.50	

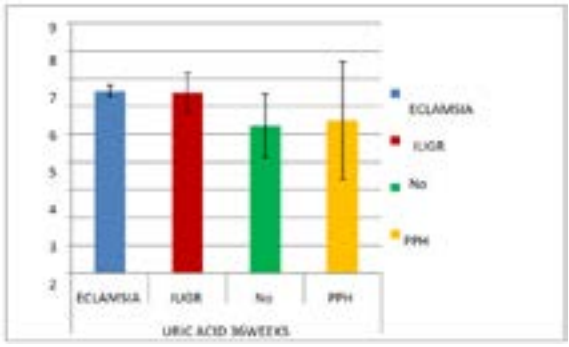

Table 13: *Distribution of mean uric acid at 36 weeks: Maternal complication.*

In eclampsia, the mean uric acid of patients was 6.55 ± .21. In IUGR, the mean was 6.50 ± .7071. In PPH, the mean was 5.3071 ± 1.1467. Distribution of mean with maternal complication was statistically significant (p = 0.02582).

LDH 36 weeks	Birth asphyxia	4	526.500	102.610	400	610	54.0	<0.0001
	MAS	8	614.0	148.0	398.0	836.0	616.0	
	NICU admission	7	472.0	66.062	365.0	584.0	470.0	
	No	42	455.69	9.00	276.09	688.0	444.00	
	Sepsis	1	997.0	.00	997.0	997.0	997.0	

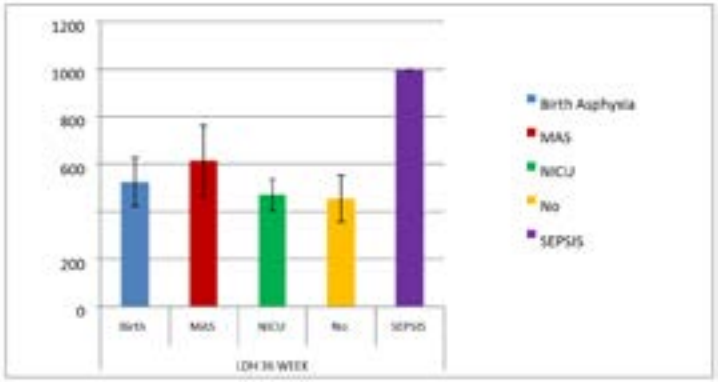

Table 14: *Distribution of mean LDH at 36 weeks: Neonatal complication.*

In birth asphyxia, the mean LDH was 526.50 ± 102.6109. In MAS, the mean was 614.25 ± 148.4537. In NICU admission, the mean was 472.2857 ± 66.0624, In SEPSIS, the mean was 997.00 ± .00. Distribution of mean with neonatal complication was statistically significant (p < 0.0001).

Uric acid 36 weeks	Birth asphyxia	4	5.87	.80	5.10	7.00	5.70	P value
	MAS	8	6.40	1.29	4.00	8.20	5.70	.0250
	NICU admission	7	5.47	1.08	3.50	7.10	6.40	
	No	42	5.10	1.07	3.10	7.60	5.60	
	Sepsis	1	6.80	.000	6.80	6.0	6.80	

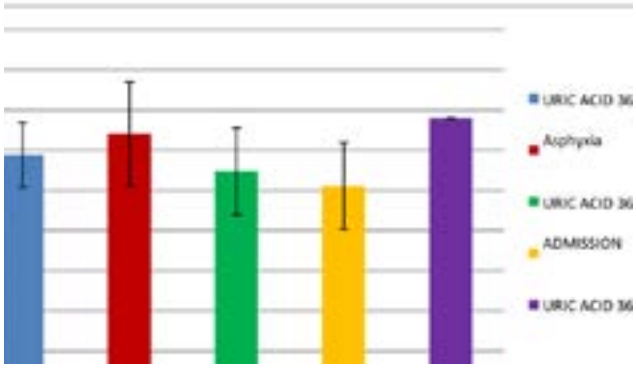

Table 15: *Distribution of mean uric acid at 36 weeks: Neonatal complication.*

In birth asphyxia, the mean was 5.8750 ± .8057. In MAS, the mean of patients was 6.40 ± 1.2928. In NICU admission, the mean uric acid 36 weeks of patients was 5.4714 ± 1.0828. In sepsis, the mean uric acid was 6.8000 ± .0000. Distribution of mean uric acid 36 weeks with neonatal complication was statistically significant (p = 0.0250).

Discussion

It was a comparative study conducted in the department of OBG at ESI-PGIMSR, ESIC Medical college, Joka, Kolkata 124 patients were included 62 patients where hypertensive group 62 patients were normotensive group. In our study, out of 124 patients most of the patients were 21-30 years [40 (64.5%)].

Hypertensive group compared normotensive group 39 (62.9%) and mean age of cases was 28.9355 ± 4.6725 years and control 27.0806 ± 4.7089 years, according to Meghal., *et al*. mean age of the cases is 25 years and control 24 years, according to study conducted by Sonagra., *et al*. [8], mean age of case is 24 and control 23 years.

In our study mean period of gestation of cases were 36.0484 ± 2.8597%, control is 36.4677 ± 3.5929 where primigravida were 34 (54.8%) in cases and 48 (77.4%) in controls. Multigravida 21 (33.9%) were cases and 9 (14.55%) were controls according to Meghal., *et al*. is 65%. According to Lincy Joseph., *et al*. [6] primi were 53.8% and control were 27%, multigravida was 42%.

It was found that, majority number of patients had IUGR-7 (11.3%) in hypertensive group compared to normotensive group - 2 (3.2%) but this was statistically significant (p = 0.0029). and also, maximum number of patients had NVD-58 (93.5%) in normotensive group compared to hypertensive group 20 (32.3%), was statistically significant (p < 0.0001). In our study 70 patient delivered by LSCS due to malpresentation previous LSCS. Eclampsia IUGR oligohydramnios remaining patients were delivered vaginally.

It was found that, a greater number of patients had meconium aspiration syndrome as neonatal complication- 8 (12.9%) in normotensive group compared to hypertensive group- 5 (8.1%) which was statistically significant (p = 0.0067).

In our study we found significantly elevated levels of serum mean LDH in cases (524.419) whereas eclampsia is 5 (631.800), IUGR is 7 (547.7), placenta previa 3 (487), PPH is 6 (475) and severe preeclampsia is 4 (604.25), compared to controls (Eclampsia is two, IUGR is two (590). Similar results were seen in study by Gandhi M., *et al*. [12] they found a significant increase in serum LDH (mean LDH is 512.86) and serum LDH in control group is 226.8. Uric acid levels in women with hypertension in comparison with normotensive women.

Serum LDH has also found to be a useful predictor of fetus in small for gestational age [9]. In our study NICU admission were 5, where serum mean LDH is 507 and Birth asphyxia were 5 where mean was 439. which is significant (p value - 0.046).

There was statistically significant increase in maternal complications with increasing LDH and uric acid levels (p-<0.05). According to Qublan H., *et al*. [11] serum LDH can be used as predictor of IUGR.

In our study we did serial estimation of uric acid levels and serum LDH levels starting from 20 weeks onwards whose mean age was 30 years in both cases and controls. Uric acid levels were high (5.7%) in case group compared to control group (5.0%) which was correlate with Raja Lakshmi., *et al*. in our study in eclampsia patients' uric acid was elevated in (6.55 mg/dl), whereas according to Rajalaksmi., *et al*. uric acid was 6.47 mg/dl.

In our study out of 62 patients, only two patients had developed eclampsia and two patients had severe preeclampsia, two patients had IUGR, this finding is in accordance with the study done by Punthamapol Gandhi., *et al*. [12]. Besides the reduced clearance hyperuricemia in preeclampsia may be due to uric acid levels increase proportionately with the severity of disease Maternal hyperuricaemia is found to be a strong predictor of maternal disease progression and fetal outcome-like growth retardation in women presenting with HDP [14].

Our study, uric acid at 36 weeks was higher in hypertensive group [5.7274 ± 1.1431] compared to normotensive group [5.0919 ± 1.1660] but this was statistically significant (p = 0.008). In our study mean SBP in cases were 147.129 mmHg and controls were 129.338 mmHg. Respectively diastolic BP in cases was 90.161 mmHg and 83.2903 mmHg in controls but this was statistically significant (p < 0.0001), according to Meghal., *et al*. (2018) mean systolic BP were 152.48 mmHg in cases and 113 mmHg in controls, respectively diastolic BP in cases was 101.4 and 76.88 mmHg in controls and another. Similar study by Pramanik T., *et al*. [10] found that significantly high blood pressure [SBP 149.42 ± 12.35 vs 109.00 ± 7.93 mm Hg; DBP 96.85 ± 8.32 vs 72.5 ± 7.10 mm Hg], and serum uric acid level [6.27 ± 1.37 vs 4.27 ± 0.61 mg/dl] in pre-eclamptic patients compared to their healthy counterparts.

We observed that, DBP was higher in hypertensive group [90.1613 ± 3.2653] compared to normotensive group [83.2903 ± 7.6660] but this was statistically significant (p < 0.0001). Similar study by Babbar K., *et al*. [13] (2015) examined that the first group received alpha-methyl dopa 250 mg thrice a day, second 20 mg bd nifedipine and the third one labetalol 100 mg bd. Mean arterial pressure calculated by systolic BP +2 DBP/3. The fall in BP calculated along with time required, dose of drug required, spontaneous/ induced labour or caesarean section, adverse maternal and the fetal outcome was observed. Similar study Sonagra., *et al.* [8] 2012 found r value of LDH with systolic and diastolic blood pressure as 0.504 and 0.546 respectively.

Data of our study showed that, LDH 36 weeks was higher in eclampsia group compared to PPH group but this was statistically significant.

In our study, LDH 36 weeks was higher in sepsis + neonatal death group compared to birth asphyxia group but this was statistically significant.

We observed that, uric acid 32 weeks was higher in birth asphyxia group compared to NICU admission group but this was statistically significant.

Conclusion

As pre-eclampsia is multi systemic disorder with unknown aetiology associated with increased maternal mortality and perinatal morbidity serial estimation of serum uric acid and serum LDH in early pregnancy is helpful in preventing, maternal mortality and morbidity with perinatal morbidity and prompt termination of pregnancy can be done whenever is necessary.

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