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ORIGINAL RESEARCH

Study of serum LDH levels and its correlation with maternal and perinatal outcome in preeclampsia

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ABSTRACT

Background: Pre-eclampsia is one of the leading causes of maternal and fetal morbidity and mortality. Lactate dehydrogenase (LDH) is an intracellular enzyme which converts pyruvic acid to lactic acid during glycolysis Present study was aimed to study the correlation of maternal and perinatal outcomes with serum LDH levels in women with hypertensive disorders of pregnancy.

Material and Methods: Present study was prospective, observational study, conducted in antenatal women with singleton pregnancy and gestational age 28 weeks onward with hypertensive disorders of pregnancy (mild/ severe pre-eclampsia), serum LDH levels were estimated.

Results: In present study, 50 pregnant women were studied. Majority women were from 20-25 years age group (60 %), nulliparous (70 %), unbooked (68 %). Hypertensive disorders of pregnancy were mild pre-eclampsia (56 %) & severe pre-eclampsia (44 %). In present study, Mean LDH value in mild preeclampsia group was 564.3 ± 184.3 IU/l & in severe preeclampsia group was 766.3 ± 264.3 IU/l, difference was statistically significant. Majority women underwent LSCS (64 %). Maternal complications such as eclampsia, abruption, HELLP were more in > 800 IU/L LDH value patients. Perinatal outcome was poor in pregnant women with > 800 IU/L LDH value, 8 (16 %) neonates required NICU admission, while 7 (14 %) were low birth weight. Perinatal mortality was noted in 2 cases (1 from 600-800 IU/L LDH group & 1 from >800 IU/L LDH group).

Conclusion: With raised LDH values, decision regarding management and prevention of complications should be taken, so as to reduce the maternal & neonatal, morbidity & mortality.

Keywords: Serum LDH, preeclampsia, hypertensive disorders of pregnancy. maternal morbidity,

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INTRODUCTION

Pre-eclampsia is a multisystem disorder, unique to pregnant women after twenty weeks of gestation. Pre-eclampsia is one of the leading causes of maternal and fetal morbidity and

mortality.[1] Placental abruption, eclampsia, disseminated intravascular coagulation, intracranial hemorrhage, heart failure, hepatic failure and renal failure are the lethal maternal complications. Early screening of hypertension during pregnancy and preeclampsia may reduce perinatal and maternal complications.[2]

The analysis of biochemical markers particularly markers related to vascular dysfunction such as LDH, AST, uric acid may enrich the ability to predict and prevent preeclampsia in near future.[3] Lactate dehydrogenase (LDH) is an intracellular enzyme which converts pyruvic acid to lactic acid during glycolysis

Literature review suggested that in preeclampsia the progressive endothelial dysfunction in maternal vascular system induced by toxins released from hypoxic placenta cause profound vasoconstriction affecting all organ system including liver. This hypoperfusion induced ischemic injury to hepatic cells and other organs cause increased release of intracellular LDH to circulation.[4,5] Present study was aimed to study the correlation of maternal and perinatal outcomes with serum LDH levels in women with hypertensive disorders of pregnancy.

MATERIAL AND METHODS

Present study was prospective, observational study, conducted in department of Obstetrics and Gynaecology & Department of Biochemistry at XXX medical college & hospital, XXX, India. Study duration was of 1 year (July 2021 to June 2022). The study was approved by the Ethical Committee of the institute.

Inclusion criteria

- Antenatal women with singleton pregnancy and gestational age 28 weeks onward with hypertensive disorders of pregnancy (mild /severe pre-eclampsia),[6] willing to participate in study.

Exclusion criteria

- Antenatal woman with diabetes, renal failure, haemolytic anemias, gestational diabetes, multiple pregnancy, liver disease, stroke, coronary artery disease, chronic lung diseases, connective tissue disorders, disseminated intravascular coagulation and seizures,
- Women with chronic hypertension, medical disorders, and taking hepatotoxic drugs

After obtaining informed and written consent, the detailed history and thorough clinical examination of all participants were done. All women were subjected to routine antenatal investigations. Serum LDH levels were estimated by enzymatic method on the autoanalyzer. Participants were followed till delivery, and fetal and maternal outcomes were assessed in terms of spontaneous or induced labor, gestational age at delivery, and mode of delivery.

The patients were divided into two groups, group I (n=28) women with mild pre-eclampsia, and group II (n=22) patients with severe pre-eclampsia. After analysis of the results the women were divided into 3 categories according to the level of lactic dehydrogenase-LDH (400-600, 600–800, and >800 IU/l) in order to identify the group with high risk of developing complications. LDH levels of both the groups were compared, and association of maternal and perinatal outcome was assessed in relation to LDH levels.

Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Frequency, percentage, means and standard deviations (SD) was calculated for the continuous variables, while ratios and proportions were calculated for the categorical variables. Difference of proportions between qualitative variables were tested using chi-square test or Fisher exact test as applicable. P value less than 0.5 was considered as

statistically significant.

RESULTS

In present study, 50 pregnant women were studied. Majority women were from 20-25 years age group (60 %), nulliparous (70 %), unbooked (68 %). Hypertensive disorders of pregnancy were mild pre-eclampsia (56 %) & severe pre-eclampsia (44 %).

Table 1: General characteristics

Characteristic	Frequency (n=50)	Percentage
Maternal age (in years)		
20-25	30	60.00%
26-30	10	20.00%
31-35	7	14.00%
36-40	3	6.00%
Parity		
0	35	70.00%
1	12	24.00%
2	2	4.00%
3	1	2.00%
Antenatal status		
Unbooked	34	68.00%
Booked	16	32.00%
Hypertensive disorders of pregnancy		
Mild pre-eclampsia	28	56.00%
Severe pre-eclampsia	22	44.00%

In present study, Mean LDH value in mild preeclampsia group was 564.3 ± 184.3 IU/l & in severe preeclampsia group was 766.3 ± 264.3 IU/l, difference was statistically significant.

Table 2: Distribution according to LDH levels in study group.

LDH range (IU/l)	Mild preeclampsia (n=28)	Severe preeclampsia (n=22)	Total preeclampsia (n=100)	p value
400-600	15 (30 %)	4 (8 %)	19 (38 %)	<0.001 Sig.
600-800	11(22 %)	12 (24 %)	22 (44 %)	>0.05 NS
>800	2 (4%)	7 (14%)	9 (18 %)	<0.01 Sig.
Mean value	564.3 ± 184.3 IU/l	766.3 ± 264.3 IU/l		<0.01 Sig.

Majority women underwent LSCS (64 %). Maternal complications such as eclampsia, abruption, HELLP were more in > 800 IU/L LDH value patients.

Table 3: Mode of delivery & complications

	400- 600 IU/l	600-800 IU/l	>800 IU/l	Total
Mode of delivery				
LSCS	6 (12 %)	22 (44 %)	4 (8 %)	32 (64 %)
FTVD	7 (14 %)	4 (8 %)	0	11 (22 %)
PTVD	1 (2 %)	1 (2 %)	5 (10 %)	7 (14 %)
Complications				

ECLAMPSIA	0	1 (2 %)	2 (4 %)	3 (6 %)
ABRUPTION	0	2 (4 %)	1 (2 %)	4 (8 %)
HELLP	0	0	1 (2 %)	1 (2 %)

Perinatal outcome was poor in pregnant women with > 800 IU/L LDH value, 8 (16 %) neonates required NICU admission, while 7 (14 %) were low birth weight. Perinatal mortality was noted in 2 cases (1 from 600-800 IU/L LDH group & 1 from >800 IU/L LDH group).

Table 4: Comparison of perinatal outcome with LDH levels.

Parameters	**400- 600 IU/l**	**600-800 IU/l**	**>800 IU/l**	**Total**
Mean gestational age (weeks)	36.1 ± 3.2	35.3 ± 2.82	34.6 ± 1.2	35.1 ± 2.8
Mean baby weight (Kg)	2.6 ± 0.43	2.3 ± 0.62	2.08 ± 0.5	2.23 ± 0.42
NICU	2 (4 %)	7 (14 %)	8 (16 %)	17 (34 %)
LBW	1 (2 %)	4 (8 %)	7 (14 %)	12 (24 %)
VLBW	0	1 (2 %)	1 (2 %)	1 (2 %)
PERINATAL MORTALITY	0	1 (2 %)	1 (2 %)	1 (2 %)

DISCUSSION

The ability of clinicians to determine the high-risk women and foetuses early in the course of illness would enable them to tailor individual management more effectively. Identifying women at risk for adverse outcomes would allow intensive monitoring or intervention and effective use of resources.

Chronic hypoxia induces morphological, molecular, and functional changes in the placenta that closely resemble those observed in placentae from women suffering from preeclampsia. Hypoxia in turn stimulates the process of glycolysis which results in over‑ activity of Lactate dehydrogenase (LDH).[7]

Multiple factors have been implicated amongst which endothelial dysfunction is most important factor resulting in mild to moderate microangiopathy of target organs, leading to increased cell leakiness, hemolysis and cell death, ultimately excessive leakage of lactate dehydrogenase (LDH) in serum.[8]

In study by Gupta A et al.,[9] higher levels of LDH were observed in pregnant women with preeclampsia (627.38±230.04 IU/l) as compared to normal pregnant women (224.43±116.61 IU/l). The maternal complications were found to be maximum in women with LDH > 800 IU/l. Abruption was the most common complication. The perinatal mortality and neonatal deaths were found to have significant correlation with high LDH levels. Similar findings were noted in present study.

Andrews L, et al.,[10] studied 110 cases, 40 were normal pregnant women and remaining 70 were PIH cases. Out of the 70 PIH cases, 15 (21.5%) were mild preeclampsia, 35 (50.0%) were severe preeclampsia and 20 (28.5%) were eclampsia. Maternal mortality occurred in 06 cases (8.5%). Perinatal mortality was seen in 28 (40.0%), Out of these, 20 (71.4%) were stillbirth and 08 (28.6%) were neonatal deaths. There is significant rise in the LDH levels with the increasing severity of the disease (172.37±28.09) normotensive, (356.33±24.47) mild preeclampsia, (609.91±136.92) severe preeclampsia and (854.05±247.45), eclampsia (P<0.0001). Perinatal deaths occurred in 28 cases, out of these 06 (21.5%) had LDH levels <600 IU/l, 8 (28.5%) had LDH levels between 600-800 IU/l and 14 (50%) had LDH levels >800 IU/l. Similar findings were noted in present study.

In study by Lavanya B et al.,[11] 29 cases of study group with Serum LDH in the range of 600-800 IU/L, 08 (27.6%) had severe pre-eclampsia and 18 (62.0%) had eclampsia. Of 34 eclampsia cases, 18(52.9%) had Serum LDH range 600-800IU/L and 14 (41.2%) had serum

LDH >800IU/L. The mean Serum LDH in study group was 570.5 IU/L and in control group was 201.5 IU/L. The patients had maternal complications like abruption, PPH, DIC, eclampsia with LDH>600. Neonatal complications like IUGR, fetal distress, neonatal death, LBW, premature birth, IUD were increased with raised LDH. Similar findings were noted in present study.

In study by Bhati BS et al.,[12] mean LDH levels amongst subjects of normotensive group, mild PE group and severe PE group was found to be 169.2 IU/L, 338.4 IU/L and 629.7 IU/L, respectively. Non‐significant results were obtained while comparing the mean gestational age of the patients divided based on mean LDH levels. Significant results were obtained while comparing the neonatal complications and neonatal mortality amongst patients divided based on LDH levels.

Significant increase in the incidence of perinatal mortality was observed by Qublan et al in patients with increasing levels of serum LDH ($p < 0.001$).[13] The effect on perinatal outcome was also studied in Jaiswar et al and Bhave et al study demonstrating a significant increase in still births, neonatal deaths and perinatal mortality with increase in serum LDH levels.[14,15]

Serum LDH is an effective biochemical marker which can be useful in early diagnosis of pre-eclampsia and can reflect the disease severity such that appropriate measures can be taken to reduce the morbidity and mortality associated with the disease. The limitations of the study are smaller sample size with a limited follow up.

CONCLUSION

Serum LDH is a simple, easily available biochemical test that can be carried out in all antenatal mothers with hypertensive disorders of pregnancy. With raised LDH values, decision regarding management and prevention of complications should be taken, so as to reduce the maternal & neonatal, morbidity & mortality.

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