

Assessment of Serum Lactate Dehydrogenase as Early Diagnostic Biomarker in Pregnancy with Preeclampsia and Eclampsia: A Comparative Study

Prabha Verma¹, Nutan Narayan², Sangeeta Sinha³

¹Junior Resident, Department of Obstetrics and Gynaecology, Patna Medical College and Hospital, Patna, Bihar.

²Assistant Professor, Department of Obstetrics and Gynaecology, Nalanda Medical College and Hospital, Patna, Bihar.

³Professor, Department of Obstetrics and Gynaecology, Patna Medical College and Hospital, Patna, Bihar.

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Corresponding author: Dr. Prabha Verma

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Abstract

Background: Numerous changes in biochemical, physiological, hematological, and immunological processes are related to the physiological state of pregnancy. Six to eight percent of pregnancies are complicated by preeclampsia and eclampsia, which can result in a number of problems for both the mother and the fetus. The current study's objectives were to assess serum LDH levels in both normal pregnant women and pregnant women with preeclampsia and eclampsia during the antepartum phase and to investigate the relationship between serum LDH levels and maternal and perinatal outcomes.

Method: From January 2014 to December 2014, ANC mothers between the ages of 18 and 35 who had term singleton pregnancies and were attending the Obstetrics and Gynecology OPD and labor room at Patna Medical College and Hospital in Patna, Bihar, participated in this prospective study. Relevant laboratory tests were carried out following informed consent and a thorough clinical assessment. A completely automated biochemical analyzer was used to estimate the serum LDH.

Results: A total of 200 pregnant women were included in the study; 100 of them were normal pregnant women who served as the control group; the remaining 34 (17%) instances were pregnancies with eclampsia, and 66 (33%) were pregnancies with pre-eclampsia. Eight (27.6%) of the 29 study group cases with serum LDH levels between 600 and 800 IU/L had severe pre-eclampsia, and eighteen (62.0%) had eclampsia. Of the 34 cases of eclampsia, 18 (52.9%) had serum LDH levels between 600 and 800 IU/L, while 14 (41.2%) had levels greater than 800 IU/L. The study group's mean serum LDH was 570.5 IU/L, while the control group's was 201.5 IU/L. Maternal problems such as abruption, PPH, DIC, and eclampsia with LDH>600 were present in the patients. Neonatal complications like IUGR, fetal distress, neonatal death, LBW, premature birth, IUD were increased with raised LDH.

Conclusion: The first indicator of hypoxia and oxidative stress in the blood is serum LDH. Both pre-eclampsia and eclampsia raise it. In order to reduce maternal and fetal morbidity and death, high-risk individuals with elevated LDH levels must be closely monitored and treated promptly. A predictive indicator for preeclampsia and eclampsia is the measurement of serum lactate dehydrogenase.

Keywords: Preeclampsia, Eclampsia, Serum lactate dehydrogenase.

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Introduction

Numerous changes in metabolic, biochemical, physiological, hematological, and immunological processes are related to the physiological state of pregnancy. All of these alterations can be reversed a few days to several months after delivery if there are no difficulties.[1] Over 5–10% of pregnancies worldwide result in pregnancy-induced

hypertension (PIH), a frequent pregnancy complication.[2] Six to eight percent of pregnancies are complicated by preeclampsia and eclampsia, which can result in a number of problems for both the mother and the fetus. Maternal morbidity and mortality are linked to the PIH. Complications include eclampsia, placental

abruption, acute renal failure, and pulmonary oedema in the mother may result from it. Additionally, it may occasionally result in perinatal mortality and is linked to increased fetal problems such as growth restriction, fetal distress, and hypoxia ischemic encephalopathy.[3]

The enzyme lactate dehydrogenase (LDH) is primarily found inside cells. It is in charge of the cells' conversion of lactate to pyruvate. Its concentrations within cells are many times higher than those in the plasma. When hemolysis, cell death, and enhanced cell leakiness occur, its levels rise. Increased cell death and leakiness are linked to PIH. Therefore, elevated LDH levels are frequently observed in PIH.[4–6]

The current study's objectives were to evaluate the antepartum serum LDH levels of normal pregnant women and pregnant women with preeclampsia and eclampsia, as well as to investigate the relationship between serum LDH levels and maternal and perinatal outcomes.

Materials and Methods

From January 2014 to December of 2014, the Obstetrics and Gynecology department at Patna Medical College and Hospital in Patna, Bihar, collaborated with the Biochemistry department to perform this prospective comparative study.

Pregnant women were enrolled in this study in the third trimester of pregnancy and divided into following groups:

- Group 1—healthy normal pregnant women (controls)
- Group-2—patients of preeclampsia and eclampsia (subjects).

This was further subdivided into following subgroups (a) Mild preeclampsia (b) Severe preeclampsia (c) Eclampsia

Subjects were also divided according to the serum LDH levels into following groups:-

1. <600 IU/l
2. 600–800 IU/l
3. >800 IU/l

Blood was collected aseptically for analysis of Serum LDH along with routine blood investigations. LDH levels was estimated in Erba biochemical fully automated analyzer by using Kinetic UV test.

All women were followed until delivery and early postpartum period and babies till early neonatal period.

Pregnant women with any gravida, ≥20 weeks of gestation, age between 18-35 years and Singleton pregnancy were included in this study. Pregnant women with essential hypertension or hypertension <20 weeks gestation, preexisting diabetes mellitus, renal disease, liver disorder, hyperthyroidism, epilepsy, urinary tract infection, cardiovascular disease were excluded in this study.

All characteristics were summarized descriptively. For continuous variables, the summary statistics of mean±standard deviation (SD) were used. For categorical data, the number and percentage were used in the data summaries and diagrammatic presentation. Chi-square (X²) test was used for association between two categorical variables.

Results

A total of 200 pregnant women were included in the study; 100 of them were normal pregnant women who served as the control group; the remaining 34 (17%) instances were pregnancies with eclampsia, and 66 (33%) were pregnancies with pre-eclampsia. Of the pre-eclampsia cases, 41 (62.1%) had moderate eclampsia and 25 (37.9%) had severe pre-eclampsia.

The majority of patients in both the trial group and the control group were between the ages of 20 and 24. In terms of age group, there was no statistically significant difference between the control and study groups.

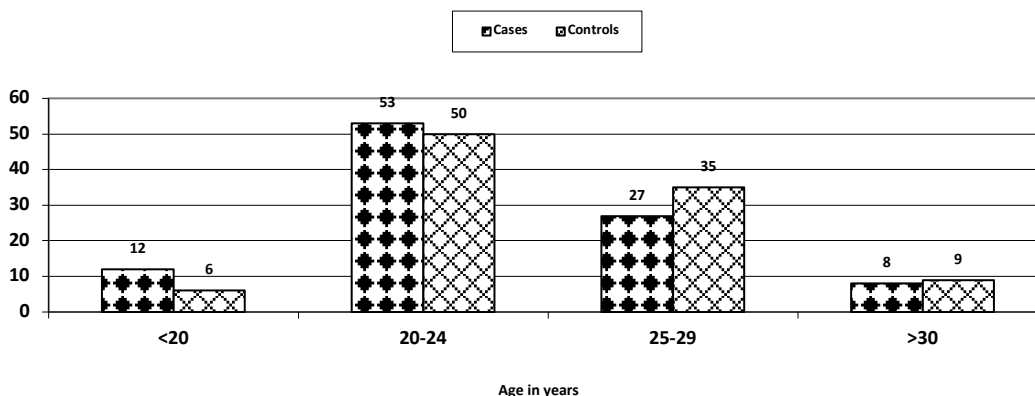


Figure 1: Distribution of age between cases and controls

Among control group 94% of them had SBP <140 mmHg and 96% had DBP <90 mmHg. However, among study group 66% had SBP were in the range of 140-160 mmHg and 81% had DBP range 90-110 mmHg. The difference between case and control were statistically significant in both systolic & diastolic group. Out of 51 cases in study group with Serum LDH <600 IU/L, 37 (72.5%) cases showed mild pre-eclampsia and 12 (23.5%) cases showed severe Pre-eclampsia. In 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 mean serum LDH in eclampsia cases was 725.0 IU/L and in pre-

eclampsia 565.5 IU/L. However the difference of serum LDH between pre-eclampsia and eclampsia was statistically insignificant (p value 0.22). The perinatal outcome in serum LDH <600 IU/L was 7.8% IUGR, 5.9% fetal distress, and 3.9% neonatal death and still birth. In serum LDH range 600-800 IU/L, the perinatal outcome was 3.4% IUGR & LBW. In serum LDH >800 IU/L, 5% cases had IUGR and 15% had neonatal death and still birth. Though the LDH level was raised in eclampsia compared to severe pre-eclampsia, the difference was not statistically significant in perinatal outcome. The maternal outcome in serum LDH <600 IU/L was 2% in abruption with PPH (post-partum hemorrhage), DIC, eclampsia and PPH, with serum LDH between 600 & 800 IU/L was 6.9% PPH and with serum LDH >800 IU/L was 5% in PPH cases.

Table 1: Distribution of SBP & DBP between cases and controls

SBP (mmHg)	Cases		Controls		p-value
	Number	Percentage	Number	Percentage	
<140	9	9	94	94	<0.001*
140-160	66	66	4	4	
>160	25	25	2	2	
Total	100	100	100	100	
DBP (mmHg)	Number	Percentage			<0.001*
<90	13	13	96	96	
90-110	81	81	4	4	
>110	6	6	0	0	
Total	100	100	100	100	

Table 2: Distribution of Serum LDH among study group and control

Serum LDH (IU/L)	Cases			Total Cases	Control	p-value
	Mild Pre-eclampsia	Severe Pre-eclampsia	Eclampsia			
<600	37	12	02	51	99	<0.001
600-800	03	08	18	29	-	
>800	01	05	14	20	01	
Total	41	25	34	100	100	

Table 3: Mean LDH between cases and controls

Parameters	Cases		Control		p-value
	Mean	SD	Mean	SD	
LDH (IU/l)	570.5	270.9	201.9	125.9	<0.001*

Table 4: Mean LDH according to eclampsia and severe preeclampsia

Parameters	Eclampsia		Severe pre-eclampsia		p-value
	Mean	SD	Mean	SD	
LDH (IU/l)	725.0	226.1	565.5	301.1	0.221

Table 5: Perinatal outcome according to LDH

Perinatal outcome	LDH (IU/l) <600		LDH (IU/l) 600to 800		LDH (IU/l) >800		p-value
	No.	Percentage	No.	Percentage	No.	Percentage	
Fetal Distress	3	5.9%	0	0.0%	0	0.0%	0.585
IUD	1	2.0%	0	0.0%	0	0.0%	
IUGR	4	7.8%	1	3.4%	3	15.0%	
LBW	1	2.0%	1	3.4%	0	0.0%	
MSL	1	2.0%	0	0.0%	0	0.0%	
Neonatal death	2	3.9%	0	0.0%	1	5.0%	
Premature	1	2.0%	0	0.0%	0	0.0%	
Still birth	2	3.9%	0	0.0%	1	5.0%	

Discussion

Preeclampsia is a serious pregnancy illness that can have serious repercussions for both the mother and the unborn child.

Serious consequences like as eclampsia, HELLP syndrome, abruption, and even perinatal mortality and morbidity can result from severe preeclampsia.

According to a study by Jaiswar SP et al., of these 107 cases, 35 (32.7%) had moderate preeclampsia, 36 (33.6%) had severe preeclampsia, and 36 (33.6%) had eclampsia. The LDH levels significantly increased as the disease's severity increased.[7] Similar findings regarding the incidence of preeclampsia and eclampsia cases in the study group were also noted in this investigation.

According to Jaiswar SP et al., mothers with elevated serum levels of LDH had a considerably greater incidence of newborn problems, stillbirths, and perinatal deaths. In a similar vein, women with preeclampsia and eclampsia had considerably higher LDH levels in our study, and the severity of the condition as well as poor maternal and perinatal outcomes were significantly correlated with higher LDH levels.[7]

As per the study by Amit D Sonagra et al, mean LDH levels in preeclampsia was 356.46 ± 158.09 , gestational hypertension 282.3 ± 120.98 , normal pregnancy 151.57 ± 47.47 and controls $130.5 \pm 44.36.8$ In our study there is a statistically significance of mean serum LDH between control group (201.5 ± 125.9) and study group (570.5 ± 270.9). Another study by Umasatyasri et al assessed the prognostic significance of the values of serum LDH as a marker of preeclampsia – eclampsia and severity. They found Mean LDH levels in normotensive (n=50) 159.06 ± 41.93 Mild preeclampsia (n = 30) 323.30 ± 77.40 Severe preeclampsia (n =20) 636.20 ± 132.29 Eclampsia (n = 50) 649.32 ± 153.53 . [9] A research work by Qublan et al revealed a significant association of serum LDH levels with severe preeclampsia.

Increase in the incidence of perinatal deaths was also observed in patients with increasing levels of serum LDH levels. Intrauterine fetal death was seen in 4.8% of cases, intrauterine growth restriction in 33.9% and prematurity in 77.9%. Neonatal deaths were reported in 95.2% in severe preeclampsia group.[10] In our study, though there is significant association between increasing serum LDH and complications of eclampsia, neonatal death and still birth were recorded only 15%. Another study conducted by Sreelatha S et al stated that the increased LDH level correlate with severity of PIH and has got poor perinatal outcome. So it can be considered as one of the biochemical marker.[11]

The study by Amit D Sonagra et al. concluded that Serum LDH gradually increase as the disease severity increases. Regular monitoring of serum LDH level in women with Hypertension in Pregnancy may give a clue of disease severity.[8]

In patients with higher LDH levels, vigilant monitoring and prompt management may decrease maternal and perinatal morbidity and mortality.[12] Serum LDH levels can be offered to all patients of preeclampsia and can be used to predict the prognosis of preeclampsia.[13]

Conclusion

Clinicians would be better equipped to customize individual care if they could identify high-risk women and fetuses early in the illness. Identifying women who are at risk for unfavorable outcomes would enable efficient use of resources and rigorous surveillance or intervention. On the other hand, by minimizing needless intervention and surveillance, identifying women at low risk may reduce iatrogenic unfavorable maternal and newborn outcomes. Future research with a bigger sample size would confirm the findings of this study.

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