Serum lactate dehydrogenase levels in pregnant women with and without preeclampsia

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Abstract

Background: Preeclampsia, a hypertensive disorder of pregnancy, affects 10% of pregnancies causing maternal and fetal complications. It is associated with complications such as elevated serum Lactate dehydrogenase (LDH) levels. LDH is an intracellular enzyme that increases when there is cellular death. Since preeclampsia leads to cellular death, serum LDH levels may reflect the severity of preeclampsia and serve as a guide in patient management. The aim of this study is to estimate serum LDH levels in preeclamptic and non-preeclamptic women and compare the levels between them.

Methods: A cross-sectional study was conducted in the Department of Biochemistry in collaboration with the Department of Obstetrics and Gynecology, RIMS, Imphal from February 2021 to September 2022. The study included 100 participants, 50 diagnosed with preeclampsia and 50 non-preeclamptic women attending RIMS hospital. Blood samples were collected from the patient, and serum LDH was estimated using a spectrophotometric method. All the data were analyzed using SPSS V21.0.

Results: The study elevated that serum LDH levels were significantly higher (P-value < 0.05) in preeclamptic women (510.10±184.26 IU) compare to pregnant women without preeclampsia (284.38±97.35) IU. Serum LDH levels were positively correlated with an increase in blood pressure.

Conclusion: This study demonstrated that serum LDH levels are higher in patients with preeclampsia than in non-preeclamptic women. LDH levels are positively correlated with higher blood pressure. Therefore, detecting serum LDH levels may help in detection of preeclampsia so that it may help in close monitoring, prompt and early management of preeclamptic women.

Keywords: Pregnancy; Blood pressure; Hypertension

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Introduction

Preeclampsia is a pregnancy-specific disorder characterized by the new onset of hypertension and significant proteinuria in a previously normotensive woman on or after 20 weeks of gestation with or without pathological edema (1,2). Hypertension in preeclampsia is characterized by a systolic blood pressure of 140mmHg or higher and a diastolic pressure of 90 mmHg or higher, confirmed by at least two measurements within a span of 6 hours (3,4). This condition may present complications such as visual disturbances, oliguria, eclampsia, hemolysis, elevated liver enzymes, thrombocytopenia, pulmonary edema and fetal growth restriction (5).

Preeclampsia is a multisystem medical condition that affects both the mother and fetus (6) It is estimated that preeclampsia is a leading cause of death among all maternal deaths and contributes heavily to maternal and perinatal morbidity (7). It affects approximately 5-10% of pregnancies worldwide (8). The main treatment of preeclampsia is the termination of the pregnancy. Therefore, early diagnosis of women at high risk of preeclampsia is a key issue in the management of the condition (9).

Lactate dehydrogenase (LDH) is an intracellular enzyme that converts pyruvic acid to lactic acid during glycolysis. LDH gene expression and activity are higher in placentas of preeclampsia compare to normal pregnancy (10). Hypoxia in preeclampsia enhances glycolysis and increases LDH activity (11). Organ dysfunction in severe preeclampsia caused by vascular endothelial dysfunction, leads to excessive LDH leakage and elevated levels in serum. Therefore, serum LDH levels may be used to assess the severity of preeclampsia and could be useful for early management of the disease. The aim of this study is to estimate serum LDH levels in preeclamptic and non-preeclamptic women and compare the levels between them.

Methods

This hospital-based comparative cross-sectional study was conducted in the Department of Biochemistry in collaboration with the Department of Obstetrics and Gynaecology, at the Regional Institute of Medical Sciences, Imphal, from February 2021 to September 2022. The study was approved by the Research Ethical Board, at RIMS, Imphal. The study population consisted of 100 pregnant women above 18 years of age; 50 women diagnosed with preeclampsia were taken as cases and 50 pregnant women without preeclampsia were taken as controls. Convenient sampling was followed in our study. Pregnant women with preexisting hypertension, multiple pregnancies, renal disease, urinary tract infection, gestational diabetes mellitus, smokers, alcohol consumers, thyroid disease and neoplastic disease were excluded from the study.

Informed written consent was obtained from all participants. Blood samples were collected in plain vials, and serum LDH was estimated using the spectrophotometric method in the Randox RX IMOLA Biochemistry Analyzer. The study was approved by the Research Ethical Board, at RIMS, Imphal. All data were analyzed using SPSS V21.0. Qualitative data were expressed as frequency and percentage and quantitative data were presented as means and standard deviation (SD) then and analyzed using an independent t-test. The Pearson correlation coefficient was used to find the correlation between serum LDH and blood pressure.

Results

As shown in Table 1, the mean age of the cases was 30.36 years old, while that of the controls was 27.48 years old. The difference was found to be statistically significant ($p<0.05$). Both systolic blood pressure (SBP) and diastolic blood pressure (DBP) were significantly higher in women with preeclampsia compared to pregnant women without preeclampsia (p-value=0.000).

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Table 1. Baseline characteristics of cases and controls (n=100)

Parameters	Cases (n=50)	Controls (n=50)	P-value
Age (Years)	30.36± 5.50	27.48±5.96	0.014
SBP (mmHg)	158.56±15.77	115.52±6.96	0.000
DBP (mmHg)	103.68±10.45	75.52±5.08	0.000

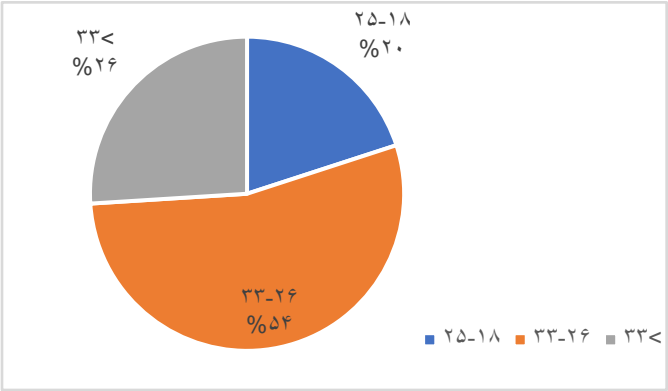

Figure 1. Show the age distribution of the cases with a majority of the cases (n =50) falling within in the age-group of 26-33 years

Table 2. Comparison of serum LDH levels between cases and controls

Parameter	Cases	Controls	P-value
Serum LDH (IU)	510.10±184.26	284.38±97.35	0.000

Table 2 shows that the serum LDH level was significantly higher in the preeclamptic women (510.10±184.26 IU) compared to the pregnant women without preeclampsia (284.38±97.35IU) (p-value=0.000).

Table 3. Correlation between blood pressure parameters and serum LDH levels among cases

Parameter	Pearson correlation (r)	P-value
SBP (mmHg)	0.333	0.018*
DBP (mmHg)	0.391	0.005*

It was evident from Table 3 that both SBP and DBP were positively correlated with increase in serum LDH levels among the preeclamptic women and the correlation was found to be significant ($p<0.05$).

Discussion

In the present study, it was evident from Table 1 that the control group was slightly younger than the preeclamptic group. The mean age in the preeclamptic group was 30.36 ± 5.50 years, while in the control group it was 27.48 ± 5.96 years. This difference was statistically significant (p=0.014). This finding was supported by a study conducted by Lamminpaa R et al. (12). who observed that women of advanced maternal age had preeclampsia more often than younger women. Our study showed that SBP, and DBP were significantly higher in the cases than in the control group. The

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mean ± SD of SBP in the cases and control was found to be 158.56 ± 15.77 mmHg and 115.52 ± 6.96 mmHg respectively. The mean ± SD of DBP in cases and controls was found to be 103.68 ± 10.45 mmHg and 75.52 ± 5.08 mmHg respectively.

From Table 2, it is also evident that significantly higher serum LDH levels were observed in preeclamptic women (cases) compared to normotensive pregnant women (control). The mean ± SD of serum LDH in cases was 510.10 ± 184.26 which is significantly higher than that of the control group, which was 284.38 ± 97.35. Similar results were depicted in studies conducted by Jaiswar et al. (13), Hazari et al (14) and Gandhi et al (15). A literature review suggests that in preeclampsia the progressive endothelial dysfunction in maternal vascular system induced by toxins released from hypoxic placenta causes profound vasoconstriction affecting all organ systems including the liver. This hypoperfusion induced ischemic injury to hepatic cells and other organs lead to increased release of intracellular LDH into circulation (16).

Table 3 shows that BP parameters and serum LDH levels were positively correlated among cases and it was found to be statistically significant ($p < 0.05$). These results correlate with the studies conducted by Umasatyashri et al. (17) and Bhave et al (18). This demonstrates that there is significant association of LDH levels with preeclampsia.

Conclusion

Our study demonstrates that serum LDH levels are higher in patients with preeclampsia compared to non-preeclamptic women. LDH levels are found to be positively correlated with higher blood pressure. Therefore, detecting of serum LDH levels may help in the detection of preeclampsia so that it will help in close monitoring, prompt and early management of preeclamptic women.

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Funding sources

None.

Ethical statement

The study was approved by the Research Ethical Board, RIMS, Imphal.

Conflicts of interest

None

Author contributions

YAS conceived the study, VK and SN supervised the experiment. KRD collected and analysed the data. KRD, SN, and NA wrote the manuscript. SN analysed and interpretated the patient data. All authors read and approved the final manuscript.

Data availability statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request

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