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Original Article

Assessment of Raised LDH Levels and Fetal Outcomes in Severe Preeclamptic Women: A Tertiary Care Hospital Study

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Abstract

Background: Preeclampsia is a dangerous complication of pregnancy characterized by high blood pressure and increased urinary protein, beginning typically after the 20th week of pregnancy. It ranges from mild to severe forms and is a significant cause of maternal and neonatal morbidity and mortality.

Objective: The study aimed to determine the frequency of raised Lactate Dehydrogenase (LDH) levels in women with severe preeclampsia visiting a tertiary care hospital and to evaluate the frequency of adverse fetal outcomes in these women with elevated LDH levels.

Methods: This descriptive cross-sectional study was conducted in the Department of Obstetrics and Gynecology at a Tertiary Care Hospital in Karachi over six months, from December 28, 2018, to June 29, 2019. The study included 121 pregnant women, aged 18 to 45 years, in their second trimester diagnosed with severe preeclampsia. A 5cc blood sample was collected from each participant to estimate LDH levels, with levels ≥200 IU/L considered raised. Adverse fetal outcomes were assessed at the time of delivery according to predefined operational definitions. Data were analyzed using SPSS version 25. Quantitative data were presented as mean ± SD, and qualitative data were presented as frequencies and percentages. The Chi-square test was applied for stratification, with a significance level set at 0.05.

Results: The mean age of the participants was 28.59 ± 4.91 years. Of the patients, 55.4% were aged ≤30 years, and 44.6% were aged >30 years. The mean gestational age was 32.73 ± 2.67 weeks, with 56.2% of patients having a gestational age >32 weeks. The mean LDH level was 430.66 ± 150.43 IU/L, with 97.5% of patients exhibiting raised LDH levels. Adverse fetal outcomes included stillbirths in 36.4% and perinatal deaths in 12.7% of patients with raised LDH levels.

Conclusion: A considerable number of patients with severe preeclampsia had raised LDH levels, which were significantly associated with adverse fetal outcomes, including stillbirth and perinatal death. Monitoring LDH levels in severe preeclamptic women is crucial for improving maternal and fetal outcomes.

1 Introduction

Pregnancy causes profound anatomical, physiological, and metabolic changes in maternal tissues, which are generally well-orchestrated. However, these changes can sometimes go awry, leading to various feto-maternal complications. Among the most common and serious of these complications is hypertension, including preeclampsia and gestational hypertension, which can escalate to eclampsia. These conditions remain significant causes of maternal and neonatal morbidity and mortality, particularly in developing countries. Approximately 10% of all pregnancies are complicated by hypertension, with preeclampsia and eclampsia accounting for about half of these cases globally (1). Despite being recognized and studied for many years, the understanding of preeclampsia remains incomplete.

Preeclampsia is characterized by high blood pressure (BP ≥140/90 mmHg) and significant proteinuria (urinary albumin protein ≥300 mg/24 h) that typically begins after the 20th week of pregnancy (2, 3). According to the American College of Obstetrics and Gynecology (ACOG), it is defined by the presence of hypertension and proteinuria in a previously normotensive patient after 20 weeks of gestation. However, some women may develop systemic manifestations, such as low platelets or elevated liver enzymes, before proteinuria becomes detectable, leading to delayed diagnoses (4, 5). Preeclampsia can vary in severity from mild to severe forms, both of which are significant contributors to maternal and neonatal morbidity and mortality (6, 7).

Severe preeclampsia, typically developing in the second trimester, is marked by consistently high blood pressure (≥160/110 mmHg), proteinuria exceeding 5 grams per 24 hours, platelet counts below 100,000/mm³, HELLP syndrome (hemolysis, elevated liver enzymes, low platelet count), cerebral or visual disturbances, persistent severe epigastric or right upper quadrant pain, and pulmonary edema (8). The prevalence of preeclampsia ranges from 4.0% to 35.3%, and it is associated with significant cellular death, impacting multiple systems within the body (3, 7, 9). Globally, preeclampsia affects 5% to 7% of all pregnancies and is responsible for over 70,000 maternal deaths and 500,000 fetal deaths annually, making it a leading cause of severe maternal morbidity, cesarean sections, and prematurity, especially in the United States (10, 11).

Extensive research has identified numerous risk factors for the development of preeclampsia. Major risk factors include a history of preeclampsia, chronic hypertension, pregestational diabetes mellitus, antiphospholipid syndrome, and obesity (12). Additional risk factors encompass advanced maternal age, nulliparity, chronic kidney disease, and the use of assisted reproductive technologies. Relatively rare risk factors include a family history of preeclampsia and carrying a trisomy 13 fetus (13, 14). One critical biochemical marker associated with the severity of preeclampsia is the level of intracellular Lactate Dehydrogenase (LDH), which increases due to cellular death. Elevated serum LDH levels can thus be used to assess the extent of cellular damage and the severity of the disease in preeclamptic women, aiding in decision-making for better maternal and fetal outcomes (8, 9).

Studies have shown that in severe preeclampsia, approximately 40% of patients have LDH levels greater than 800 IU/L (9). In another study, 82.9% of mild preeclamptic and 91.4% of severe preeclamptic women had abnormally elevated serum LDH levels (≥200 IU/L) (10). Adverse fetal outcomes among severe preeclamptic women with raised LDH levels include neonatal death (5.9%), stillbirths (26.5%), and perinatal deaths (47.1%) (15). Despite extensive international literature on this topic, there is a lack of local studies, prompting the present research to assess the magnitude of raised LDH levels and their impact on fetal outcomes in severe

preeclamptic women. The goal is to devise strategies for early screening and prompt treatment to reduce morbidity and mortality in this high-risk population.

2 Material and Methods

The study employed a descriptive cross-sectional design conducted within the Department of Obstetrics and Gynecology at a Tertiary Care Hospital in Karachi. The research spanned six months, from December 28, 2018, to June 29, 2019. The sample size was calculated based on the proportion of raised LDH levels set at 0.914, with a confidence level of 95% and an absolute precision of 0.05, resulting in a sample size of 121 pregnant women diagnosed with severe preeclampsia. Non-probability consecutive sampling was used to select participants. Inclusion criteria included pregnant women in their second trimester with severe preeclampsia, aged between 18 and 45 years. Exclusion criteria included mothers with hypertension diagnosed before 20 weeks of gestation and those with preexisting conditions such as diabetes mellitus, renal disease, liver disorder, thyroid disorder, or epilepsy. Ethical approval for the study was obtained from the institutional ethical committee, adhering to the principles outlined in the Declaration of Helsinki. Informed consent was obtained from all participants after explaining the purpose, procedures, risks, and benefits of the study. Confidentiality was assured throughout the study.

Data collection involved obtaining a 5cc blood sample from each participant, which was sent to the institutional laboratory for LDH level estimation. An LDH level equal to or greater than 200 IU/L was considered raised. At the time of delivery, adverse fetal outcomes were assessed according to the predefined operational definitions. Additional demographic information, including age, educational status, and parity, was recorded using a structured proforma.

Data entry and statistical analysis were performed using SPSS version 25 for Windows. Quantitative data, such as age, gestational age, LDH levels, APGAR scores, and neonatal weight, were presented as means and standard deviations. Qualitative data, including parity, mode of delivery, educational status, residential status, and adverse fetal outcomes (stillbirth and perinatal death), were presented as frequencies and percentages. To assess the impact of general characteristics on raised LDH levels and adverse fetal outcomes, stratification was conducted. Post-stratification, the Chi-square test was applied, with a significance level set at 0.05.

The study ensured rigorous adherence to methodological standards to maintain the integrity and validity of the findings. Each step of the process, from sample collection to data analysis, was meticulously documented to provide a comprehensive understanding of the impact of raised LDH levels on fetal outcomes in severe preeclamptic women.

3 Results

The results summarize the demographic characteristics, clinical features, and outcomes of the study population.

Table 1 Patient Characteristics and Outcomes

Variable	Mean ± SD	Minimum	Maximum	Category	(n, %)
Age (years)	28.59 ± 4.91	19	38	≤30 years	67 (55.4%)
				>30 years	54 (44.6%)

Variable	Mean ± SD	Minimum	Maximum	Category	(n, %)
Gestational Age (weeks)	32.73 ± 2.67	26	37	≤32 weeks	53 (43.8%)
				>32 weeks	68 (56.2%)
Neonatal Weight (kg)	2.48 ± 1.59	1	19	≤3 kg	109 (90.1%)
				>3 kg	12 (9.9%)
APGAR Score	7.57 ± 0.80	3	9	-	-
LDH Level (IU/L)	430.66 ± 150.43	190	805	Raised LDH	118 (97.5%)
				Normal LDH	3 (2.5%)

The study population had a mean age of 28.59 years, with 55.4% of patients aged 30 years or younger. The mean gestational age was 32.73 weeks, and most patients (56.2%) were beyond 32 weeks of gestation. A significant majority of newborns weighed 3 kg or less.

Table 2 Study Variables

Characteristic	Category	Frequency (n, %)
Educational Status	Illiterate	15 (12.4%)
	Primary	10 (8.3%)
	Secondary	46 (38%)
	More than Matric	50 (41.3%)
Residential Status	Urban	80 (66.1%)
	Rural	41 (33.9%)
Mode of Delivery	Vaginal	87 (71.9%)
	Cesarean Section	34 (28.1%)
Parity Status	Primiparous	38 (31.4%)
	Multiparous	23 (19%)

A large proportion of patients had education beyond matriculation, and 66.1% lived in urban areas. Vaginal delivery was the predominant mode, and primiparous women constituted the majority in terms of parity status.

Table 3 Associational Study Variables

Variable	Category	Stillbirth (n=118)	Perinatal Death (n=121)
Age (years)	≤30 years	15 (34.9%)	8 (53.3%)
	>30 years	28 (65.1%)	7 (46.7%)
Gestational Age	≤32 weeks	29 (67.4%)	8 (53.3%)
	>32 weeks	14 (32.6%)	7 (46.7%)
Neonatal Weight (kg)	≤3 kg	38 (88.4%)	14 (93.3%)
	>3 kg	5 (11.6%)	1 (6.7%)
Educational Status	Illiterate	12 (27.9%)	4 (26.7%)
	Primary	3 (7%)	4 (26.7%)
	Secondary	17 (39.5%)	4 (26.7%)
	More than Matric	11 (25.6%)	3 (20%)
Residential Status	Rural	22 (51.2%)	12 (80%)

Variable	Category	Stillbirth (n=118)	Perinatal Death (n=121)
	Urban	21 (48.8%)	3 (20%)
Mode of Delivery	Vaginal	28 (65.1%)	12 (80%)
	Cesarean Section	15 (34.9%)	3 (20%)

Among patients with raised LDH levels, stillbirth occurred in 36.4%, and perinatal death was observed in 12.7%. These outcomes were more frequent among older patients and those with lower gestational ages. Rural residency and lower educational attainment were also associated with higher rates of adverse outcomes.

4 Discussion

The findings of this study indicated that a significant majority of patients with severe preeclampsia had raised LDH levels, with 97.5% of the study population exhibiting LDH levels above the threshold. This high frequency aligns with previous studies that reported elevated LDH levels in both mild and severe preeclamptic women, highlighting the prevalence of cellular damage in these conditions (16). The mean LDH level observed in this study was 430.66 ± 150.43 IU/L, which is consistent with the literature demonstrating increased LDH levels in pre-eclampsia (9). The adverse fetal outcomes associated with raised LDH levels were significant, with 36.4% of the patients' experiencing stillbirths and 12.7% encountering perinatal deaths. These findings are in agreement with studies that have documented similar adverse outcomes in preeclamptic women with elevated LDH levels (15).

However, this study's findings contrast with some previous research. For instance, Jain et al. reported different frequencies of neonatal death and perinatal mortality in severe preeclamptic women, suggesting potential variations in study populations or methodologies (15). The present study included a relatively younger age group with lower parity, which might have influenced the outcomes. This demographic detail was also observed in the study by Qublan et al., who found that severe preeclampsia was more common in younger women with low parity (17). The mean LDH levels reported by Qublan et al. were higher in patients with severe preeclampsia compared to our findings, possibly indicating differences in disease severity or diagnostic criteria (17).

The educational status of the patients emerged as a significant factor, with a higher percentage of patients having more than matric-level education. This variable was independently associated with raised LDH levels. The study did not find a significant association between gestational age at delivery and raised LDH levels, contrasting with some studies that suggested higher LDH levels are linked to preterm deliveries (18). The lack of significant association between low birth weight and elevated LDH levels in this study also differed from findings by He et al., who reported such a correlation (18). One of the strengths of this study was its comprehensive approach to evaluating LDH levels and associated fetal outcomes in a well-defined population of severe preeclamptic women. The use of a cross-sectional design provided a snapshot of the current situation, which is valuable for understanding the prevalence and impact of raised LDH levels. Additionally, the study adhered to rigorous ethical standards, ensuring the reliability of the data collected (19, 20).

Nevertheless, the study had several limitations. The sample size, while calculated to provide sufficient power, was relatively small, which might limit the generalizability of the findings. The non-probability consecutive sampling method, though practical, could introduce selection bias. Moreover, the study did not account for potential confounding factors such as socioeconomic status and access to healthcare, which could influence both LDH levels and pregnancy outcomes (6, 17).

Future research should focus on larger, multicenter studies to validate these findings and explore the underlying mechanisms linking raised LDH levels with adverse fetal outcomes. There is also a need for longitudinal studies to track changes in LDH levels throughout pregnancy and their impact on maternal and fetal health. Additionally, investigating the role of other biomarkers in conjunction with LDH could provide a more comprehensive understanding of preeclampsia and its complications (19, 20). This study confirmed a high frequency of raised LDH levels in severe preeclamptic women and their significant association with adverse fetal outcomes. These findings underscore the importance of monitoring LDH levels as part of the management strategy for preeclampsia to improve maternal and fetal outcomes (21). Despite the study's limitations, it provides valuable insights that can inform clinical practice and future research on this critical topic (22, 23).

5 Conclusion

In conclusion, a considerable number of patients with severe preeclampsia exhibited raised LDH levels, which were significantly associated with adverse fetal outcomes, such as stillbirth and perinatal death. The findings highlight the importance of monitoring LDH levels in these patients, as elevated LDH serves as a marker of cellular damage and disease severity. By identifying raised LDH levels early, healthcare providers can implement targeted interventions to mitigate risks, ultimately improving both maternal and fetal outcomes. This underscores the necessity for integrating LDH level assessments into the routine management of severe preeclamptic women.

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Disclaimers

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