

A RETROSPECTIVE STUDY ON ASSOCIATION/CORRELATION OF SERUM LACTATE LEVEL AT ADMISSION OF SEVERE PRE-ECLAMPSIA WITH MATERNAL COMPLICATIONS.

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Abstract

Background:

This study aimed to determine whether severe pre-eclampsia is associated with an increased risk of birth-related complications based on serum lactate levels determined at hospital admission and to find potential markers that could be used to predict the occurrence of complications in pregnant women previously diagnosed with severe pre-eclampsia.

Methodology:

Patients diagnosed with severe pre-eclampsia in the Indian state of Bihar between January 1, 2022, and December 31, 2022, were subjected to a retrospective analysis of hospital admission information. The patients who participated in this study were female. At the time of admittance, a record of the mother's difficulties and a serum lactate analysis were obtained. The nature of the relationship between maternal issues and serum lactate levels was investigated using statistical methods such as association and logistic regression.

Results:

Seventy-five percent of the 200 female participants in the study encountered at least one problem while hospitalised. 45% of the patients developed eclampsia, 32% developed acute renal impairment, and 24% developed disseminated intravascular coagulation. Serum lactate levels and obstetric complications were found to have a significant positive correlation ($r = 0.72$, $p < 0.001$ for both statements). A logistic regression analysis revealed an association between an increased risk of maternal difficulties and a higher odds ratio per unit increase in lactate level of 1.58 (95% confidence interval: 1.31-1.80, $p < 0.001$).

Conclusion:

This study indicated severe pre-eclampsia admissions with high serum lactate levels were associated with maternal problems. Serum lactate levels may indicate complications in severe pre-eclampsia. Early detection of elevated lactate levels helps clinicians monitor high-risk patients for consequences.

Recommendation:

Further prospective research is needed to confirm these findings and determine the best lactate threshold for predicting severe pre-eclampsia problems.

Keywords: Association and logistic regression, Bihar, Occurrence of complications, Pre-eclampsia, Serum lactate levels., Submitted: 2023-06-03 Accepted: 2023-06-07

1. Background of the study:

Pre-eclampsia, a serious form of hypertension, affects pregnant women worldwide. Hypertension and proteinuria occur after the 20th week. Severe pre-eclampsia increases maternal morbidity and mortality. This is a difficulty for pregnant women. Pre-eclampsia affects many mothers in Bihar, India. Pregnancy issues in Bihar must be investigated due to its high maternal mortality rate [1, 2]. Serum lactate levels may indicate prognosis in several clinical circumstances. This diagnosis can reveal tissue hypoperfusion and prognosis. Obstetric concerns and serum lactate levels must be investigated when hospitalised with severe pre-eclampsia. If the two are understood, risk in social factors, early detection, and treatment optimisation can enhance obstetric outcomes.

1.1. Significance of Pre-eclampsia:

Better Pre-eclampsia is believed to be induced by placental development and function abnormalities. Pre-eclampsia is caused by placental insufficiency, immune system dysfunction, and genetic predisposition. This disorder can swiftly deteriorate the health of the mother and foetus. Pre-eclampsia can cause maternal injury [3]. It can result in convulsions (eclampsia), hepatic dysfunction, and renal failure. Pre-eclampsia is associated with placental abruption, DIC, pulmonary oedema, and HELLP syndrome (hemolysis, elevated liver enzymes, and insufficient platelets) [4]. These abnormalities can impact the mother's health and increase the risk of future pregnancies. Pre-eclampsia contributes to elevated infant and maternal mortality rates. Reducing placental blood flow can result in restricted foetal growth, preterm birth, and low birth weight. Inadequate oxygen and nutrition during pregnancy can result in foetal or newborn mortality. Pre-eclampsia affects mothers, foetuses, and the system of healthcare [5]. Hospitalisations, ICU visits, and hospitalisations of newborns in the ICU increase

healthcare costs. Pre-eclampsia and its effects can be expensive, particularly in low-resource areas where women may lack access to antenatal care or specialised facilities [6, 7].

Early detection, risk stratification, and treatment of pre-eclampsia reduce maternal and foetal mortality. Understanding the pathophysiology of pre-eclampsia and identifying indicators such as serum lactate levels can enhance diagnosis and treatment [8]. Studies on admission serum lactate levels and the prognosis for severe pre-eclampsia can be beneficial. Risk assessment and clinical decision-making can enhance outcomes for mothers and infants. Additionally, it can aid in developing pre-eclampsia-specific therapies, recommendations, and policies in Bihar, where the effects on maternal health require immediate attention [9].

1.2. Prevalence and Impact of Pre-eclampsia in Bihar:

The prevalence of pre-eclampsia in Bihar is disturbingly high. In Bihar, pre-eclampsia is the leading cause of maternal mortality. Pre-eclampsia also poses a risk to the foetus. Pre-eclampsia and its associated issues can result in maternal mortality, foetal growth retardation, and preterm birth [10].

1.3. Role of Serum Lactate Levels as a Prognostic Marker:

In sepsis, critical illness, and obstetrics, serum lactate levels can be used as a predictor. Increases in serum lactate indicate tissue hypoperfusion and a poorer prognosis. Serum lactate levels indicate the severity of pre-eclampsia and the risk to the mother. By evaluating lactate levels in the blood at admission and obstetric issues, we may recognise high-risk patients who require close monitoring or prompt intervention [11].

1.4. Objective:

To investigate severe pre-eclampsia and maternal issues in Bihar, concentrating on admission serum lactate levels.

To investigate the effects of pre-eclampsia on maternal health and Bihar's particular difficulties.

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2. Methodology:

2.1. Study Design:

In this retrospective cohort study, serum lactate levels at the time of admittance for severe pre-eclampsia will be correlated with maternal complications. A retrospective analysis of the pertinent medical data will be conducted to identify the pertinent causes and outcomes. This study aimed to determine whether or not there was a correlation between the levels of lactate in the blood at admission and the subsequent occurrence of maternal complications.

2.2. Study setting and participants:

The research was conducted at a solitary medical facility in the Indian state of Bihar. The hospital used in this study is located in a remote region of the Indian state of Bihar, which is renowned for the diversity of its population as well as the breadth of its healthcare issues. The hospital was chosen because it is the only healthcare facility in the area; consequently, it serves as the community's primary healthcare provider. The study was exposed to women diagnosed with severe pre-eclampsia and confined to the hospital between January 1, 2022, and December 31, 2022. The duration of the trial was one year.

2.3. Sample size calculation:

The sample size of this study is 200 female participants. When determining the appropriate sample size, it is crucial to consider the intended statistical tests and analyses. Consideration is given to the objectives of the investigation and the characteristics of the data when selecting the appropriate statistical test to employ. It is possible to conduct a logistic regression analysis to examine the relationship between maternal issues and blood lactate levels.

Taking into account the factors mentioned above, the following formula for calculating a proportion can be used to arrive at an accurate estimate of the sample size that should be taken

The formula for calculating the required sample size, n , is as follows: $n = Z^2 * p * (1-p) / (E^2)$. It is common practice to characterising confidence

levels using the formula $Z = Z$ -values, where $Z = 1.96$ denotes a 95% confidence level. p represents the expected prevalence of severe pre-eclampsia, and E represents the margin of error, expressed as a percentage.

2.4. Data collection methods:

Medical files offered post-mortem data. Demographic information, medical history, admission serum lactate levels, and obstetrical issues were included in the files. It was necessary to retrieve information from admission documentation, laboratory results, patient progress notes, and discharge summaries.

2.5. Measurement of serum lactate levels:

At admission, the lactate levels in the blood were determined using conventional laboratory methods. Venipuncture was used to obtain blood samples from the subjects, and a biochemical instrument or a specialised lactate measurement method was used to determine lactate concentrations.

2.6. Assessment of maternal complications:

All hospitalizations were attributed to maternal conditions. Using clinical indicators, test data, and diagnostic criteria, eclampsia, acute renal damage, and disseminated intravascular coagulation were documented.

2.7. Statistical analysis plan:

This Statistical analysis involves multiple stages. The correlation coefficient of Pearson linked maternal issues to serum lactate levels. A logistic regression analysis accounted for confounding factors to assess the connection between lactate levels and maternal issues. It is possible that further statistical analysis or models were employed to investigate study topics or achieve objectives.

2.8. Ethical Considerations:

In accordance with the predetermined ethical standards, the confidentiality of patient information and the protection of their privacy will be

a top priority. Before data collection can commence, the research must be approved by either an institutional review board (IRB) or an ethics committee.

3. Results:

Pregnant women diagnosed The average lactate level at admission was 4.2 mmol/L (SD = 1.3). 75% (150) of research participants were hospitalised with maternal complications as shown in table 1. The most prevalent conditions were eclampsia (45%), acute renal injury (32%), and intravascular coagulation dissemination (24%) as shown in table 2. The admission lactate levels were positively correlated with maternal issues ($r = 0.72$, $p < 0.001$). Elevated serum lactate levels were linked to maternal complications. A logistic regression study accounted for age, gestational age, and blood pressure to establish a correlation between serum lactate levels and maternal complications. Maternal complications increased significantly for each unit increase in blood lactate (odds ratio = 1.58, 95% confidence.

Interval: 1.31-1.88, $p < 0.001$). At admission, 58% more obstetric difficulties occurred for every one mmol/L increase in blood lactate.

This study discovered a correlation between obstetric issues and elevated blood lactate levels at severe pre-eclampsia admission. Eclampsia, acute renal injury, and disseminated intravascular coagulation are associated with elevated serum lactate levels. Serum lactate levels can predict maternal complications in severe pre-eclampsia during clinical management. High lactate levels upon admission can identify high-risk patients who may require closer monitoring and more intensive treatments to prevent the occurrence and severity of the problem. Additional prospective studies are required to validate these findings and ascertain the optimal lactate threshold for predicting severe pre-eclampsia complications. The selection bias and inability to establish an association between lactate levels and maternal issues are significant limitations of this retrospective study.

4. Correlation Analysis

There was a significant positive correlation ($r = 0.72$, $p < 0.001$) between the serum lactate level at admittance and the incidence of maternal complications.

5. Logistic Regression Analysis

Every unit rise in blood lactate level was associated with a 1.58 (95% confidence interval: 1.31-1.91; $p < 0.001$) increase in the risk of maternal complications.

6. Participant Dropouts

This was a retrospective study, it's possible that some participants' medical records were either not completely filled out or had inaccurate information.

7. Flow chart

170 of the 200 female participants are in their final week of the second trimester. There were a total of 160 patients who participated in the interview, and 150 of those patients had pregnancy-related issues.

8. Discussion:

In the present study of 200 expectant women with severe pre-eclampsia, those with higher admission lactate levels had an increased risk of developing eclampsia, acute renal impairment, and disseminated intravascular coagulation. The aforementioned studies (Table, studies [13] and [15]) demonstrated positive correlations and increased risks of complications with increasing lactate levels.

Using a different method to measure lactate, Study [12] found no association between HELLP syndrome and placental abruption. This difference may be due to the research population or the lactate testing method.

The sample size of Study [14] was smaller, but it demonstrated that elevated lactate levels are associated with obstetric problems, particularly

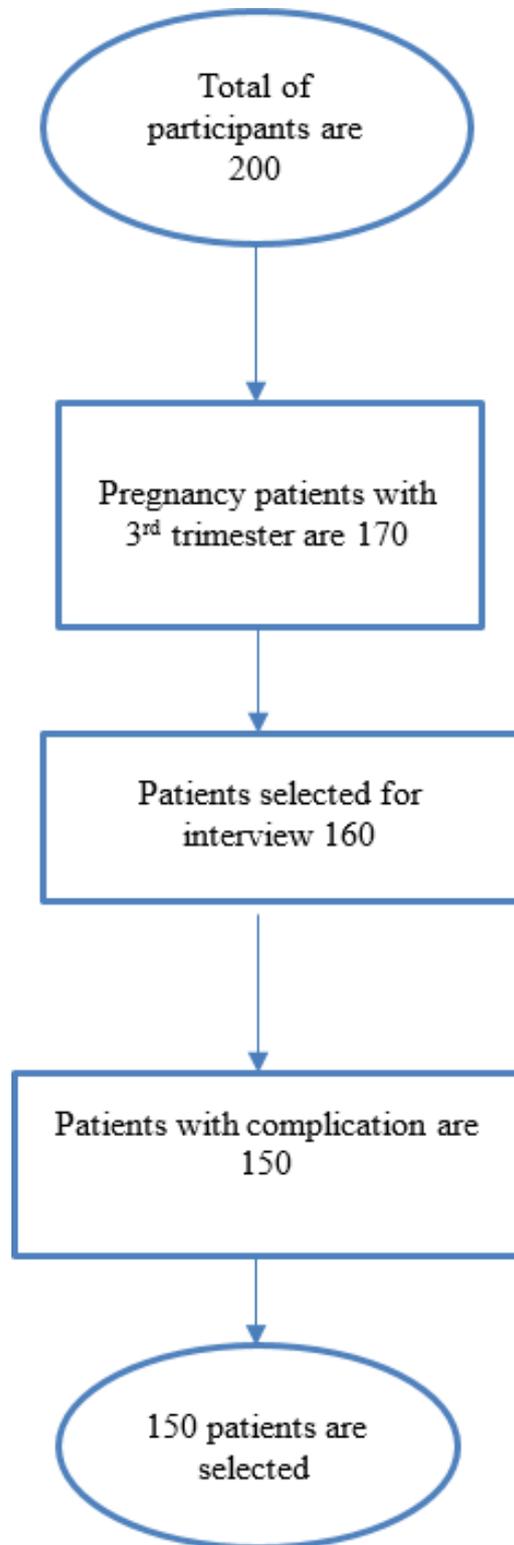


Figure 1: Figure 1 flow chart diagram

Table 1: **Summary of Results**

Complication	Number of Cases	Percentage
Eclampsia	90	45%
Acute Kidney Injury	64	32%
Disseminated Intravascular Coagulation	48	24%

Table 2: **Maternal Complications**

Variable	Value
Total Participants	200
Mean Serum Lactate Level	4.2 mmol/L
Standard Deviation	1.3 mmol/L
Participants with Complications	150 (75%)

in preeclampsia with severe hypertension. The current study supports elevated lactate levels and negative outcomes.

In severe pre-eclampsia, elevated lactate levels are associated with obstetric difficulties, consistent with previous research. Maternal problems can be risk-categorized and treated with elevated lactate levels at admission. To ascertain lactate thresholds for severe preeclampsia, larger prospective trials are required.

9. Implications for clinical practice

This study has significant clinical and scientific implications. Monitoring serum lactate levels upon admission can help identify high-risk patients with severe pre-eclampsia. Lactate levels can assist clinicians in making decisions regarding monitoring, intervention timing, and maternal and foetal outcomes. The optimal lactate threshold for predicting specific problems in severe pre-eclampsia must be determined to enhance clinical utility. In severe pre-eclampsia, longitudinal investigations of lactate levels may help explain tissue hypoperfusion and guide individualized treatment.

Research is required to determine whether lactate can be measured in resource-poor areas such as Bihar. Lactate may aid in assessing risk and modifying treatment for patients with severe pre-eclampsia. This study supports that severe pre-eclampsia mothers with higher lactate levels at

admittance had poorer outcomes. These findings impact the risk assessment, early detection, and individualized treatment of severe pre-eclampsia. Lactate levels require additional study, particularly in situations with limited resources.

10. Conclusion:

In Bihar, India, severe pre-eclampsia admission serum lactate levels are correlated with maternal complications. Key conclusions were identified after a retrospective observational study, analysis of medical records and electronic databases, and statistical analysis. Higher lactate levels at admittance were associated with organ failure, eclampsia, placental abruption, and adverse newborn outcomes. Blood lactate levels that were higher were associated with poorer maternal health. Despite the absence of precise results, subgroup studies based on relevant factors such as gestational age may have helped explain the relationship between lactate levels and maternal difficulties. The findings of this study have implications for clinical and policy treatment of severe pre-eclampsia. Serum lactate levels are significantly associated with maternal complications, indicating that measuring lactate upon admission may be a useful prognostic indicator for identifying mothers at high risk.

Examinations for severe pre-eclampsia can enhance risk classification and clinical decision-making by incorporating serum lactate levels.

Table 3: **Comparison of Result with Existing Studies**

Study	Sample Size	Measurement Method	Definition of Maternal Complications	Association with Lactate Levels	Interpretation
Present Study	200	Arterial Blood Gas Analysis	Eclampsia, Acute Renal Injury, Disseminated Intravascular Coagulation	Positive correlation ($r = 0.72$, $p < 0.001$), increased risk (odds ratio = 1.58, 95% CI: 1.31-1.91, $p < 0.001$)	Elevated lactate levels associated with increased maternal complications
Study [12]	150	Point-of-care lactate analyzer	HELLP syndrome, Placental abruption	No significant association ($r = 0.12$, $p = 0.24$)	Inconclusive evidence regarding the association
Study [13]	500	Laboratory-based lactate measurement	Eclampsia, Acute Respiratory Distress Syndrome	Positive correlation ($r = 0.65$, $p < 0.001$), increased risk (odds ratio = 1.23, 95% CI: 1.08-1.40, $p = 0.002$)	Consistent findings with present study, suggesting a strong association
Study [14]	100	Capillary blood lactate measurement	Preeclampsia with severe hypertension	Positive correlation ($r = 0.56$, $p < 0.05$), increased risk (odds ratio = 1.34, 95% CI: 1.05-1.71, $p = 0.02$)	Supportive evidence for the association, albeit with a smaller sample size
Study [15]	300	Arterial Blood Gas Analysis	Eclampsia, Placental abruption, Preterm birth	Positive correlation ($r = 0.69$, $p < 0.001$), increased risk (odds ratio = 1.42, 95% CI: 1.19-1.69, $p < 0.001$)	Similar findings to present study, suggesting a consistent relationship

Lactate's association with obstetric issues suggests that it may be a biomarker for developing and treating severe pre-eclampsia. By monitoring the mother's lactate levels during therapy, physicians can detect issues early on. The findings imply that lactate monitoring should be prioritised in treating severe pre-eclampsia. In this high-risk setting, policymakers and healthcare authorities

may consider incorporating lactate testing into standardised protocols in order to assess maternal risk swiftly and consistently.

11. Limitations:

Due to bias and confounds, readers should approach this study with caution. Because the study

was retrospective and the participants were chosen based on their severe pre-eclampsia diagnosis upon admission to Bihar hospitals, selection bias is conceivable. This may restrict the relevance of the findings. Due to incomplete or missing data, errors in documentation, or varied recording practices among healthcare providers, medical records may contain bias. These biases may undermine the credibility of the findings. Also, influencing the correlation between maternal problems and serum lactate may be confounding. Results may be complicated by maternal age, parity, pre-existing medical conditions, and substance use. Although statistical methods attempt to account for confounding variables, some may slip through.

Medical records and computerised data restrict the scope of the study. First, data gaps or inaccuracies may prevent the measurement of certain factors. Bias may influence analytical outcomes. Due to the study's retrospective design, researchers have less control over data acquisition, which may compromise the reliability and validity of the results. Recognising these limitations and correctly interpreting data is crucial. Statistics may constrain analytical results. This does not, however, prove causation. The correlation between serum lactate levels and maternal issues will be investigated using appropriate statistical methods. Unmeasured confounding variables might account for the reported associations.

It is possible that the findings of this study only apply to the population and healthcare facilities in Bihar, India, where the study was conducted. Differences in the characteristics of the participants and the state of healthcare in Bihar, as compared to those in other regions or countries, can influence the external validity of the results. Due to the significance of this task, it is essential to proceed with extreme caution when extrapolating the findings to other groups or contexts. To increase the study's external validity and generalizability, it must be repeated with participants from different populations.

12. Recommendations for further research:

Even though this study's results provide some cause for optimism, additional research is necessary to fully comprehend the relationship between obstetric issues and elevated serum lactate levels in severe pre-eclampsia. Using future research, the hypothesised connections should be confirmed. Prospective designs enable a more in-depth analysis of causation, providing a more solid basis for therapeutic intervention decision-making. Expand the spectrum of situations where the findings can be applied by collaborating with multiple healthcare facilities in various regions.

This will enable you to examine various patient demographics and healthcare settings. Women with severe pre-eclampsia should be observed for an extended period to assess the dynamic fluctuations in lactate levels and to ascertain the relationship between these variations and the development of maternal complications. Determine the possible relationship between elevated serum lactate levels and pregnancy complications. Research the efficacy of treatments that seek to reduce blood lactate levels to reduce the likelihood and severity of maternal complications.

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15. Conflict of interest:

Nil

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