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Original Research Article

Correlation of abnormal liver function tests in pregnancy with fetomaternal outcome at a tertiary care centre

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ABSTRACT

Background: Liver dysfunction during pregnancy is an important cause of maternal and perinatal morbidity. Abnormal liver function tests may indicate pregnancy-specific liver disorders, viral hepatitis, or hepatic involvement in systemic obstetric complications. Early identification is essential for risk stratification and timely management. This study aimed to evaluate the correlation between abnormal liver function tests during pregnancy and fetal-maternal outcomes.
Methods: This prospective observational study was conducted in the Department of Obstetrics and Gynaecology, LLRM Medical College, Meerut, over 18 months. A total of 150 pregnant women with abnormal liver function tests were enrolled after informed consent. Demographic details, obstetric profile, clinical presentation, liver function parameters, viral markers, maternal outcomes, and neonatal outcomes were recorded and analysed.
Results: The mean age of participants was 28.99±3.91 years. Most women were multigravida (88.0%) and unbooked (70.0%). Pruritus was the most common presenting symptom (66.66%), followed by nausea and vomiting (30.66%) and jaundice (18.66%). Mean serum bilirubin was 1.92±3.12 mg/dl, mean aspartate aminotransferase was 196.48±223.96 U/l, and mean alanine aminotransferase was 212.40±249.79 U/l. Cesarean delivery was performed in 41.33% of cases. Postpartum haemorrhage occurred in 43.3%, intensive care unit admission was required in 19.33%, and maternal mortality was 0.66%. Low birth weight occurred in 24.66%, neonatal intensive care unit admission in 40.66%, neonatal jaundice in 26.66%, respiratory distress in 24.66%, and perinatal mortality in 5.33%.
Conclusions: Abnormal liver function tests in pregnancy were associated with significant maternal and neonatal morbidity. Early diagnosis, regular antenatal monitoring, timely referral, and multidisciplinary management are essential for improving feto-maternal outcomes.

Keywords: Liver function tests, Pregnancy, Fetomaternal outcome, Intrahepatic cholestasis, HELLP syndrome

INTRODUCTION

Liver dysfunction during pregnancy represents an important obstetric challenge because it may arise from physiological adaptations of pregnancy, pregnancy-specific liver disorders, or liver diseases coincidentally occurring during gestation. Although serum alkaline phosphatase may increase physiologically due to placental production, serum bilirubin and aminotransferases usually remain within the normal non-pregnant range; therefore, elevation of bilirubin, aspartate aminotransferase, alanine aminotransferase, or bile acids should be considered pathological and requires systematic evaluation.[1,2] Pregnancy-related liver disorders include hyperemesis gravidarum, intrahepatic cholestasis of pregnancy, preeclampsia-associated hepatic dysfunction, HELLP syndrome, and acute fatty liver of pregnancy. These conditions differ in timing, biochemical pattern, severity, and prognosis, but all may contribute to significant maternal and perinatal morbidity if diagnosis or referral is delayed.[2,3] Intrahepatic cholestasis of pregnancy is the most common pregnancy-specific hepatic disorder and is

classically associated with pruritus and raised bile acids. Higher bile acid concentrations, particularly levels ≥100 µmol/l, have been associated with increased risk of stillbirth, preterm birth, meconium-stained liquor, and neonatal intensive care admission.[4,5] Hypertensive disorders with hepatic involvement and HELLP syndrome may progress rapidly to thrombocytopenia, coagulopathy, renal dysfunction, placental abruption, postpartum haemorrhage, and intensive care requirement.[3-6] Acute fatty liver of pregnancy, though uncommon, remains a potentially life-threatening emergency requiring early recognition, multidisciplinary stabilization, and timely delivery.[6,7]

In India, abnormal liver function tests in pregnancy are clinically important because late presentation, unbooked status, viral hepatitis, anaemia, and limited access to specialist care may worsen outcomes. Recent Indian studies have reported hypertensive disorders, intrahepatic cholestasis, and viral hepatitis as major contributors to deranged liver function tests in pregnancy, with increased rates of preterm birth, low birth weight, neonatal intensive care admission, maternal morbidity, and perinatal mortality.[8,9] Hence, correlation of liver function abnormalities with fetomaternal outcomes is essential for risk stratification, timely referral, and appropriate obstetric intervention. The present study was undertaken to evaluate abnormal liver function tests in pregnancy and their association with maternal and perinatal outcomes at a tertiary care centre.

METHODS

Study type, place and period

This was a hospital-based prospective observational study conducted in the Department of Obstetrics and Gynaecology at Lala Lajpat Rai Memorial Medical College and the associated tertiary care hospital, Meerut, Uttar Pradesh, India. The study was carried out over a period of 18 months. A total of 150 pregnant women with abnormal liver function tests were enrolled after applying the eligibility criteria and obtaining written informed consent.

Selection criteria

All pregnant women attending the antenatal clinic, obstetric emergency, labour room, or admitted to the obstetrics ward during the study period were screened for liver function abnormalities when clinically indicated. Pregnant women of any gestational age with deranged liver function tests, including raised serum bilirubin, aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, or serum bile acids, were included in the study. Women who were willing to participate and provided informed consent were enrolled.

Women who did not provide consent, women with incomplete clinical or laboratory records, and those lost before assessment of maternal or perinatal outcome were excluded. Patients with known chronic medical disorders unrelated to pregnancy that could independently alter maternal or foetal outcome were excluded when adequate clinical attribution was not possible.

Study procedure

After enrolment, detailed demographic, clinical, and obstetric information was recorded in a predesigned case record form. Data included maternal age, parity, booking status, gestational age at presentation, presenting complaints, relevant past obstetric history, medical history, and clinical examination findings. Special attention was given to symptoms suggestive of hepatic dysfunction, including pruritus, jaundice, nausea, vomiting, abdominal pain, malaise, altered sensorium, and bleeding manifestations.

All enrolled patients underwent routine obstetric evaluation and relevant laboratory investigations. Liver function assessment included serum total bilirubin, direct bilirubin, aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, serum proteins, and serum bile acids, wherever available. Complete blood count, platelet count, renal function tests, coagulation profile, urine examination, and viral markers for hepatitis B, hepatitis C, and hepatitis E were performed as clinically indicated. Ultrasonography and other supportive investigations were performed as needed for maternal or fetal assessment.

The probable etiology of abnormal liver function tests was determined based on clinical presentation, gestational age, biochemical pattern, viral markers, associated hypertensive disorder, platelet count, and relevant obstetric findings. Pregnancy-specific causes such as intrahepatic cholestasis of pregnancy, preeclampsia-associated liver dysfunction, HELLP syndrome, acute fatty liver of pregnancy, and hyperemesis gravidarum were assessed. Non-pregnancy-specific causes, particularly viral hepatitis and pre-existing liver disease, were also considered.

Patients were managed according to institutional obstetric protocols. Maternal monitoring included serial clinical assessment, liver function monitoring, foetal surveillance, decision regarding timing and mode of delivery, need for blood product transfusion, and requirement of intensive care admission. The mode of delivery was decided according to maternal condition, foetal condition, gestational age, obstetric indication, and severity of liver dysfunction. Maternal outcomes recorded were mode of delivery, preterm delivery, postpartum haemorrhage, blood transfusion requirement, intensive care unit admission, and maternal mortality. Perinatal outcomes recorded were birth weight, low birth weight, neonatal intensive care unit admission, neonatal jaundice, respiratory distress, intrauterine death, early neonatal death, and overall perinatal mortality.

Ethical approval

The study was conducted after approval from the Institutional Ethics Committee of LLRM Medical College, Meerut. Written informed consent was obtained from all participants before enrolment. Confidentiality of patient identity and clinical information was maintained throughout the study. The study was observational, and no additional interventions were performed solely for research purposes.

Statistical analysis

Data were entered into Microsoft Excel and analysed using appropriate statistical software. Continuous variables were expressed as mean±standard deviation, while categorical variables were expressed as frequency and percentage. Comparison of continuous variables between two groups was performed using the independent-samples t-test or the Mann–Whitney U test, depending on the data distribution. Comparisons among more than two groups were performed using analysis of variance or the Kruskal–Wallis test, as appropriate. Categorical variables were compared using the Chi-square test or Fisher's exact test. The association between liver function parameters and maternal or perinatal outcomes was assessed using appropriate correlation and comparative statistical tests. A p value of <0.05 was considered statistically significant.

RESULTS

A total of 150 pregnant women with abnormal liver function tests were included in the study. The mean age of the study population was 28.99±3.91 years. Most women belonged to the age group of 26-30 years. Multigravida women constituted the majority of the study population, accounting for 132 cases (88.0%), while primigravida women accounted for 18 cases (12.0%).

Table 1: Baseline demographic and obstetric profile of study participants.

Variables	Findings
Total number of patients	150
Mean age (years)	28.99±3.91
Most common age group (years)	26-30
Primigravida	18 (12.0%)
Multigravida	132 (88.0%)
Booked cases	45 (30.0%)
Unbooked cases	105 (70.0%)
Preterm presentation, <37 weeks	76 (50.66%)
Term/post-term presentation, ≥37 weeks	74 (49.34%)

More than two-thirds of the women were unbooked, with 105 patients (70.0%) having no regular antenatal registration. Preterm presentation was common, and 76 women (50.66%) presented before 37 completed weeks of gestation (Table 1). Pruritus was the most common presenting symptom, observed in 100 patients (66.66%). Nausea and vomiting were reported by 46 patients (30.66%), while jaundice was present in 28 patients (18.66%). These findings indicate that cholestatic symptoms were common among pregnant women with abnormal liver function tests in the present study (Table 2).

Table 2: Clinical presentation of study participants.

Presenting symptom	Number of patients (N)	Percentage (%)
Pruritus	100	66.66
Nausea and vomiting	46	30.66
Jaundice	28	18.66

Viral markers were negative in most cases. Hepatitis C infection was detected in 10 patients (6.66%), hepatitis B infection in 9 patients (6.0%), and hepatitis E infection in 4 patients (2.66%). The mean haemoglobin level was 10.66±1.81 g/dl. The mean serum bilirubin level was 1.92±3.12 mg/dl. Serum transaminase levels were markedly elevated, with a mean aspartate aminotransferase of 196.48±223.96 u/l and a mean alanine aminotransferase of 212.40±249.79 u/l (Table 3).

Table 3: Laboratory and biochemical profile.

Parameters	Findings
Haemoglobin	10.66±1.81 g/dl
Total bilirubin	1.92±3.12 mg/dl
Aspartate aminotransferase	196.48±223.96 u/l
Alanine aminotransferase	212.40 ± 249.79 u/l
Hepatitis B positive	9 (6.0%)
Hepatitis C positive	10 (6.66%)
Hepatitis E positive	4 (2.66%)

Maternal morbidity was frequent in women with abnormal liver function tests. Caesarean section was performed in 62 patients (41.33%). Postpartum haemorrhage occurred in 65 patients (43.3%), and blood transfusion was required in 22 patients (14.66%).

Admission to the intensive care unit was required in 29 patients (19.33%). One maternal death was recorded, giving a maternal mortality rate of 0.66% (Table 4).

Raised liver function parameters were significantly associated with adverse maternal outcomes. Women requiring intensive care admission had significantly higher levels of total bilirubin, aspartate aminotransferase, alanine aminotransferase, and alkaline phosphatase. Similarly, higher bilirubin, transaminase, and bile acid levels were associated with caesarean delivery and postpartum haemorrhage. The requirement for blood transfusion was also significantly associated with elevated bilirubin and transaminase levels.

Table 4: Maternal outcomes.

Maternal outcomes	Number of patients (N)	Percentage (%)
Caesarean delivery	62	41.33
Postpartum haemorrhage	65	43.3
Blood transfusion requirement	22	14.66
Intensive care unit admission	29	19.33
Maternal mortality	1	0.66

Perinatal complications were also common. Low birth weight was observed in 37 neonates (24.66%). Neonatal intensive care unit admission was required in 61 neonates (40.66%). Neonatal jaundice occurred in 40 neonates (26.66%), while respiratory distress was seen in 37 neonates (24.66%). Perinatal mortality was observed in 8 cases (5.33%) (Table 5). Adverse perinatal outcomes showed a significant association with worsening liver function parameters. Mothers of neonates with low birth weight, neonatal intensive care unit admission, neonatal jaundice, respiratory distress, and perinatal mortality had higher bilirubin, aspartate aminotransferase, alanine aminotransferase, and bile acid levels.

Table 5: Perinatal outcomes.

Perinatal outcomes	Number of cases (N)	Percentage (%)
Low birth weight	37	24.66
Neonatal intensive care unit admission	61	40.66
Neonatal jaundice	40	26.66
Respiratory distress	37	24.66
Perinatal mortality	8	5.33

Serum bile acids showed a particularly strong association with preterm birth, low birth weight, and neonatal intensive care unit admission. Preterm pregnancies had higher serum bile acid levels compared with term pregnancies (Table 6).

Table 6: Association of liver function abnormalities with adverse fetomaternal outcomes.

Outcomes	Associated biochemical parameters	Statistical significance	Interpretation
Intensive care unit admission	Bilirubin, aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase	P<0.001	Higher liver parameters were associated with severe maternal morbidity
Caesarean delivery	Bilirubin, aspartate aminotransferase, alanine aminotransferase, bile acids	P<0.001	Severe biochemical abnormality increased the likelihood of operative delivery.
Postpartum haemorrhage	Bilirubin, aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, bile acids	P≤0.004	Hepatic dysfunction was associated with increased bleeding risk
Blood transfusion	Bilirubin, aspartate aminotransferase, and alanine aminotransferase	P<0.001	Higher liver dysfunction was associated with haemorrhagic morbidity
Preterm birth	Serum bile acids	P<0.001	Raised bile acids were significantly associated with preterm pregnancy
Low birth weight	Bilirubin, aspartate aminotransferase, alanine aminotransferase, bile acids	P<0.001	Maternal liver dysfunction was associated with impaired foetal outcome
Neonatal intensive care unit admission	Bilirubin, aspartate aminotransferase, alanine aminotransferase, bile acids	P<0.001	Higher biochemical abnormality was associated with greater neonatal morbidity.
Perinatal mortality	Bilirubin, aspartate aminotransferase, alanine aminotransferase, bile acids	P<0.001	Severe liver dysfunction was associated with poor perinatal outcome

DISCUSSION

The present prospective observational study demonstrates that abnormal liver function tests in pregnancy are strongly associated with adverse maternal and perinatal outcomes. Liver dysfunction in pregnancy is clinically important because it may represent pregnancy-specific disorders, coincidental acute or chronic liver disease, or hepatic involvement secondary to systemic obstetric complications. Current guidelines emphasize that pregnancy-related liver disorders require early recognition, careful biochemical interpretation, and multidisciplinary management because they can progress rapidly and are associated with significant maternal and

foetal morbidity.[3-6] In the present study, abnormal liver function tests were associated with high rates of postpartum haemorrhage, cesarean delivery, intensive care unit admission, neonatal intensive care unit admission, low birth weight, respiratory distress, and perinatal mortality.

The mean age of women in the present study was 28.99±3.91 years, and most patients belonged to the 26-30-year age group. This finding is comparable to Indian studies in which liver dysfunction during pregnancy was commonly observed in women in the reproductive age group of the late twenties and early thirties.[8,9] In the present study, multigravida women constituted 88% of cases. Although several pregnancy-specific liver disorders may occur in either primigravida or multigravida women, recurrent disorders such as intrahepatic cholestasis of pregnancy may partly explain the higher proportion of multigravida patients. The high proportion of unbooked cases in the present study is clinically relevant. Seventy percent of women were unbooked, indicating inadequate antenatal surveillance and delayed presentation. This is important because early antenatal assessment allows detection of pruritus, jaundice, hypertension, thrombocytopenia, raised transaminases, and other warning signs before progression to severe maternal or foetal compromise.[3-6]

Pruritus was the most common presenting symptom in the present study, reported in 66.66% of patients. This pattern suggests that intrahepatic cholestasis of pregnancy was a major contributor to liver dysfunction in the study population. Intrahepatic cholestasis of pregnancy is characterized by pruritus with elevated serum bile acids and is one of the most common pregnancy-specific liver disorders.[5,6] Ovadia et al in a large individual patient data meta-analysis, showed that adverse perinatal risk in intrahepatic cholestasis of pregnancy increases with rising bile acid concentrations, particularly when bile acids are ≥100 µmol/l.[5] Similarly, Arthuis et al reported higher rates of neonatal complications, including respiratory distress and neonatal intensive care unit admission, in pregnancies complicated by intrahepatic cholestasis.[10] In the present study, elevated bile acids were particularly associated with preterm birth, low birth weight, and neonatal intensive care unit admission, which supports the established role of bile acids as an important marker of foetal risk.

Serum transaminases were markedly elevated in the study population, with a mean aspartate aminotransferase of 196.48±223.96 u/l and alanine aminotransferase of 212.40±249.79 u/l. Dajti et al emphasized that raised aminotransferases during pregnancy should not be considered physiological and require structured evaluation for pregnancy-specific and non-pregnancy-specific causes.[2] EASL guidelines also state that liver diseases in pregnancy include both gestational hepatic disorders and acute or chronic liver diseases occurring coincidentally during pregnancy, and both categories may adversely affect maternal and foetal outcomes.[3] In the present study, viral hepatitis markers were positive in a small proportion of cases, with hepatitis C in 6.66%, hepatitis B in 6%, and hepatitis E in 2.66%. This finding highlights that viral hepatitis remains an important differential diagnosis in pregnant women with abnormal liver function tests, especially in low- and middle-income settings.

Maternal morbidity was substantial in the present study. Cesarean delivery was performed in 41.33% of patients. Women undergoing cesarean delivery had higher bilirubin, transaminases, and bile acid levels, suggesting that worsening biochemical dysfunction may contribute to obstetric decision-making through maternal instability, foetal compromise, or associated hypertensive disease. A recent Indian study by Singh et al also reported that abnormal liver function tests in pregnancy were associated with poor fetomaternal outcomes and increased obstetric intervention.[8] Pathak et al similarly observed that pregnancies with abnormal liver function tests had worse maternal and foetal outcomes compared with those with normal liver function tests, with intrahepatic cholestasis being a major contributor.[9]

Postpartum haemorrhage occurred in 43.3% of women in the present study, and blood transfusion was required in 14.66% of cases. This high haemorrhagic morbidity may reflect the combined effects of hepatic dysfunction, coagulopathy, thrombocytopenia, hypertensive disease, operative delivery, and delayed referral. Hepatic involvement in preeclampsia and HELLP syndrome is particularly important because it may be associated with thrombocytopenia, haemolysis, elevated liver enzymes, disseminated intravascular coagulation, placental abruption, renal dysfunction, and intensive care requirement.[11,12]

Acute fatty liver of pregnancy, though less common, is also a life-threatening obstetric emergency associated with hepatic failure, coagulopathy, renal dysfunction, hypoglycaemia, encephalopathy, and maternal mortality if not recognized promptly.[7] The finding that higher bilirubin, aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, and bile acids were significantly associated with postpartum haemorrhage and intensive care unit admission in the present study supports the role of liver function abnormalities as markers of severe systemic maternal disease.

Admission to the intensive care unit was required in 19.33% of patients. This reflects the serious nature of liver dysfunction in pregnancy and the need for multidisciplinary care involving obstetricians, hepatologists or physicians, anaesthesiologists, intensivists, neonatologists, and blood bank support. FIGO and EASL guidelines both emphasize that women with liver disease in pregnancy should be risk-stratified and managed in an appropriate care setting, particularly when there is severe biochemical abnormality, coagulopathy, hypertensive disease, acute liver failure, or foetal compromise.[3-6] Maternal mortality in the present study

was 0.66%, which was lower than some Indian reports but still clinically important because most deaths related to liver dysfunction are potentially preventable through early diagnosis, timely referral, correction of coagulopathy, and appropriate timing of delivery.[8,9]

Perinatal morbidity was also high. Low birth weight was observed in 24.66% of neonates, neonatal intensive care unit admission in 40.66%, neonatal jaundice in 26.66%, respiratory distress in 24.66%, and perinatal mortality in 5.33% of cases. These outcomes are consistent with previous evidence showing that maternal liver dysfunction is associated with preterm birth, foetal distress, meconium-stained liquor, respiratory morbidity, neonatal intensive care admission, stillbirth, and perinatal death.[5,10,13]

In the present study, mothers of neonates with adverse outcomes had higher bilirubin, transaminases, and bile acid levels. The association between elevated bile acids and adverse foetal outcomes is biologically plausible because bile acids may contribute to placental dysfunction, foetal arrhythmia, meconium passage, and spontaneous or indicated preterm birth.[5,13] Huang et al in a recent systematic review and meta-analysis, also reported that intrahepatic cholestasis of pregnancy is associated with adverse obstetric and neonatal outcomes, reinforcing the need for bile acid-based risk assessment.[13]

The present study has important clinical implications. First, abnormal liver function tests in pregnancy should be treated as a warning sign rather than an isolated biochemical abnormality. Second, pruritus, jaundice, hypertension, thrombocytopenia, abdominal pain, altered sensorium, and bleeding manifestations should prompt urgent evaluation. Third, bile acid measurement should be considered wherever available because it helps identify foetal risk in suspected intrahepatic cholestasis of pregnancy. Fourth, unbooked status and delayed referral remain modifiable system-level contributors to adverse outcomes in Indian tertiary care settings. Strengthening antenatal screening, timely referral from peripheral centres, and protocol-based management may reduce maternal and perinatal morbidity.

The strength of the present study lies in its prospective observational design and the evaluation of both maternal and neonatal outcomes in a tertiary care setting. However, some limitations should be acknowledged. Being a single-centre study, the findings may not be generalizable to all populations. The study included only women with abnormal liver function tests and did not include a parallel control group with normal liver function tests. Serum bile acid levels may not have been uniformly available for all patients. In addition, the study did not perform long-term maternal or neonatal follow-up. Despite these limitations, the study clearly demonstrates that deranged liver function tests in pregnancy are associated with clinically significant maternal and perinatal morbidity and should prompt early diagnosis, close surveillance, and multidisciplinary management.

CONCLUSION

Abnormal liver function tests during pregnancy are important predictors of adverse maternal and perinatal outcomes. In the present study, elevated bilirubin, transaminases, alkaline phosphatase, and bile acid levels were associated with increased maternal morbidity, including cesarean delivery, postpartum haemorrhage, blood transfusion requirement, intensive care unit admission, and maternal mortality. Adverse neonatal outcomes such as preterm birth, low birth weight, neonatal intensive care unit admission, neonatal jaundice, respiratory distress, and perinatal mortality were also more frequent among women with greater biochemical derangement. Pruritus was the most common presenting symptom, highlighting the need for active evaluation of cholestatic liver disease during pregnancy. The high proportion of unbooked cases further emphasizes the importance of regular antenatal care, early biochemical screening, timely referral, and multidisciplinary management. Routine assessment and close monitoring of liver function abnormalities during pregnancy can support early risk stratification, appropriate obstetric intervention, and improved feto-maternal outcomes.

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