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Original Research Article

Maternal Outcomes of HELLP Syndrome in Relation with the Mode of Delivery

Article History:

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Abstract:
Objective: To compare maternal outcomes according to mode of delivery among women with HELLP syndrome at tertiary care hospital. ***Study Design:*** A descriptive cohort study.
Place and Duration of Study: Department of Obstetrics and Gynaecology Gomal Medical College MTI, D.I. Khan, from 15th April 2025 to 15th September 2025. ***Methodology:*** A total of 235 pregnant women aged 18 to 40 years with singleton pregnancy, gestational age above 28 weeks and haemolysis, elevated liver enzymes and low platelet count syndrome were included. Participants were followed from enrolment until hospital discharge. Maternal outcomes including blood transfusion, oliguria, hypertensive crisis and prolonged hospitalisation were recorded. Data were analysed using Statistical Package for the Social Sciences version 26. Categorical variables were compared using chi-square test or Fisher exact test, and p-value ≤0.05 was considered significant. ***Results:*** The mean age was 28.96 ± 5.26 years and mean gestational age was 33.68 ± 2.88 weeks. Caesarean section was performed in 155 (66.0%) patients and vaginal delivery in 80 (34.0%). Blood transfusion was required in 80 (34.0%), oliguria occurred in 33 (14.0%), hypertensive crisis in 47 (20.0%), and prolonged hospitalisation in 65 (27.7%). Blood transfusion was significantly higher after caesarean section than vaginal delivery, 62 (40.0%) versus 18 (22.5%) (p=0.007). Oliguria was also higher, 28 (18.1%) versus 5 (6.3%) (p=0.014) as was hypertensive crisis, 39 (25.2%) versus 8 (10.0%) (p=0.006). ***Conclusion:*** Caesarean section was associated with higher frequency of blood transfusion, oliguria and hypertensive crisis among women with haemolysis, elevated liver enzymes and low platelet count syndrome.

Keywords: Haemolysis, Hypertension, Oliguria, Pregnancy, Transfusion, Vaginal delivery.

INTRODUCTION

HELLP syndrome is an obstetric problem that is majorly caused by severe pre-eclampsia, and it causes considerable harm to the mother.1 This obstetric problem is characterized by the triad of hemolysis, liver enzymes and decreased platelets.2 HELLP syndrome may develop quite rapidly if not managed on time. Mode of delivery plays a key role in management of HELLP syndrome. This is because continuing pregnancy could increase the chances of suffering from other complications due to maternal problems. Cesarean delivery is usually preferred in case of severe maternal, fetal problems or difficult cervix.3

Some of the maternal consequences associated with HELLP syndrome are hypertensive conditions, post-partum bleeding, placental abruption, kidney damage, liver malfunction, disseminated intravascular coagulation and ICU admissions.4 There is a possibility that the likelihood and type of complications could depend on the method of delivery. For instance, cesarean delivery has been associated with blood loss, anesthetic issues,

infections, and prolonged hospital stays in patients with low platelet count and coagulopathy.5 On the other hand, vaginal delivery helps in avoiding surgical complications but could be difficult for patients with severe disease.6

The evaluation of maternal outcomes depending on delivery mode is vital in order to choose the most beneficial approach in patients with HELLP syndrome.7 Although the emergency situation might require a cesarean delivery, it is not always associated with better maternal outcome than vaginal delivery.8 The patients undergoing cesarean section tend to have higher risks of developing postpartum hemorrhage, blood transfusion needs, infections and prolonged hospitalization period, which indicate more severe condition or need for urgent delivery.9 In case the vaginal delivery is possible, this approach might help avoid the above-mentioned complications and ensure faster maternal recovery.10 At the same time, serious maternal complications can occur after both delivery methods, and early recognition and adequate treatment of the condition is what really matters.11

The evaluation of maternal outcomes in HELLP syndrome in terms of the type of delivery is required because there is a high level of potential risks in this particular group. Sometimes the decision regarding the method of delivery may be rather difficult and depends on the degree of the disease and maternal health status. The information concerning the complications in case of vaginal and cesarean deliveries is rather scarce. This study will help to understand the maternal outcomes and make appropriate recommendations regarding the choice of the delivery type.

METHODOLOGY

This descriptive cohort study was conducted in the Department of Obstetrics and Gynaecology, Gomal Medical College MTI, D.I. Khan, from 15th April 2025 to 15th September 2025. A total of 235 pregnant women were included in the study. The study was commenced after approval from the relevant Institutional Ethical Committee. Permission for conducting the research was obtained before enrolment of the participants and data collection was started after fulfilment of the ethical requirements.

The sample size of 235 was calculated through WHO sample size software by taking 95% confidence level, 2% margin of error and expected frequency of blood transfusion as 2.5% among patients with HELLP syndrome.12 The participants were enrolled by using non-probability consecutive sampling technique.

Women aged 18 to 40 years were included. Singleton pregnancy confirmed on ultrasound, gestational age >28 weeks according to LMP and any parity were accepted. Women having HELLP syndrome according to the study criteria were also included. Patients with pre-existing chronic hypertension, pre-existing renal disease, history of autoimmune disorders including lupus and antiphospholipid syndrome, current use of antihypertensive or anticoagulant medication, pre-existing platelet disorders and pre-existing liver disease were excluded. After obtaining informed consent, the purpose and benefits of the study were explained to the patients. Demographic information was recorded at the time of inclusion. It included age, gestational age, BMI, parity, socioeconomic status and residential status.

The enrolled women were followed until delivery. After birth continuous follow-up was done until discharge from the hospital. All patients were managed according to the departmental protocol under supervision of a consultant gynaecologist having more than 3 years of post-fellowship experience. During the follow-up the mode of delivery and maternal outcomes were recorded. Vaginal delivery was considered when the baby, placenta and membranes were delivered through the birth canal. Caesarean section was considered as an operative method for delivery of the baby after the age of viability.

HELLP syndrome was considered when laboratory findings showed LDH >600 IU/L, bilirubin >1.2 mg/dL (5.1 micromol/L), AST and/or ALT >70 IU/L and platelet count <100,000/microL (<100 x 10^9/L). Maternal outcomes included blood transfusion, Oliguria, Hypertensive Crisis and prolonged hospitalization. Blood Transfusion was considered when ≥1 units of packed red blood cells and/or ≥1 units of fresh frozen plasma were given during or after caesarean section. Oliguria was considered when urine output was <500 ml in 24 hours. Hypertensive Crisis was recorded when all of the specified findings were present, including systolic BP >160 mmHg or diastolic BP >110 mmHg on 2 occasions at least 4 hours apart unless antihypertensive treatment was started, schistocytes on peripheral blood smear with LDH >600 U/L, AST >70 U/L or ALT >70 U/L, platelet count <100,000/mm³ and proteinuria >300 mg in a 24-hour urine sample or protein/creatinine ratio >0.3 or dipstick reading of 1+ or more. Prolonged Hospitalization was considered when the duration of hospital stay was >7 days from admission to discharge. The collected data were analysed through SPSS version 26.

Categorical variable including socioeconomic status, residential status, vaginal delivery, caesarean section, blood transfusion, Oliguria, Hypertensive Crisis and prolonged hospitalization were presented as frequencies and percentage. Quantitative variables including age, gestational age, BMI, parity were presented as mean ± SD. Maternal outcome were

compared according to mode of delivery, vaginal delivery and C-section by using chi-square test or Fisher exact test. A p value ≤0.05 was considered statistically significant.

RESULTS

The mean age of the patients was 28.96 ± 5.26 years and mean gestational age at the time of presentation was 33.68 ± 2.88 weeks. The mean body mass index (BMI) of the study participants was recorded as 24.35 ± 3.62 kg/m² and mean parity was 1.47 ± 1.18. Regarding the socioeconomic distribution, majority of the patients were belonging to low socioeconomic class which were 133 (56.6%), followed by middle class 89 (37.9%) and high class 13 (5.5%). In terms of residential status, 145 (61.7%) of the patients were from urban areas whereas 90 (38.3%) were from rural background. As regards to mode of delivery, 155 (66.0%) patients were delivered via caesarean section whilst 80 (34.0%) were delivered vaginally (Table 1).

Table 1. Patient Demographics n=235

Demographics	Mean ± SD / n (%)
Age (years)	28.96 ± 5.26
Gestational Age (weeks)	33.68 ± 2.88
BMI (kg/m²)	24.35 ± 3.62
Parity	1.47 ± 1.18
Socioeconomic Status	
Low n (%)	133 (56.6%)
Middle n (%)	89 (37.9%)
High n (%)	13 (5.5%)
Residential Status	
Rural n (%)	90 (38.3%)
Urban n (%)	145 (61.7%)
Mode of Delivery	
Vaginal n (%)	80 (34.0%)
C-Section n (%)	155 (66.0%)

With respect to maternal outcomes observed in the study population, blood transfusion was required in 80 (34.0%) patients and oliguria was noted in 33 (14.0%) of cases. Hypertensive crisis was developed in 47 (20.0%) patients and prolonged hospitalisation was observed in 65 (27.7%) of the study participants (Table 2).

Table 2. Frequency of Maternal Outcomes of HELLP Syndrome n=235

Maternal Outcomes	Yes n (%)	No n (%)
Blood Transfusion	80 (34.0%)	155 (66.0%)
Oliguria	33 (14.0%)	202 (86.0%)
Hypertensive Crisis	47 (20.0%)	188 (80.0%)
Prolonged Hospitalization	65 (27.7%)	170 (72.3%)

On comparison of maternal outcomes according to mode of delivery, blood transfusion was significantly more frequent amongst patients who undergone caesarean section as compared to those who delivered vaginally, being 62 (40.0%) versus 18 (22.5%) respectively (p=0.007). Similarly, oliguria was also found more commonly in caesarean section group with 28 (18.1%) cases as compared to only 5 (6.3%) in vaginal delivery group and this difference was found statistically significant (p=0.014). Hypertensive crisis was likewise more prevalent in caesarean section group, being recorded in 39 (25.2%) patients as compared to 8 (10.0%) in vaginal delivery group, with statistically significant difference observed between the two groups (p=0.006). Prolonged hospitalisation was noted in 49 (31.6%) patients in caesarean section group and 16 (20.0%) patients in vaginal delivery group, however this difference was not reaches to the level of statistical significance (p=0.059) (Table 3).

Table 3. Comparison of Maternal Outcomes by Mode of Delivery n = 235

Maternal Outcomes	Vaginal n=80 n (%)	C-Section n=155 n (%)	Total n=235 n (%)	P value*
Blood Transfusion				
Yes	18 (22.5%)	62 (40.0%)	80 (34.0%)	0.007
No	62 (77.5%)	93 (60.0%)	155 (66.0%)	
Oliguria				
Yes	5 (6.3%)	28 (18.1%)	33 (14.0%)	0.014
No	75 (93.8%)	127 (81.9%)	202 (86.0%)	
Hypertensive Crisis				

Yes	8 (10.0%)	39 (25.2%)	47 (20.0%)	0.006
No	72 (90.0%)	116 (74.8%)	188 (80.0%)	
Prolonged Hospitalization				
Yes	16 (20.0%)	49 (31.6%)	65 (27.7%)	0.059
No	64 (80.0%)	106 (68.4%)	170 (72.3%)	

*Chi-Square Test

DISCUSSION

The findings of present study has demonstrated that caesarean section was the predominant mode of delivery, being performed in 155 (66.0%) patients, which is consistent with the severe nature of the condition that often necessitates urgent delivery due to deteriorating maternal and foetal condition. Blood transfusion was required significantly more in caesarean section group as compared to vaginal delivery group, being 62 (40.0%) versus 18 (22.5%) respectively (p=0.007). This findings can be explained by the inherent surgical blood loss associated with caesarean delivery, which when combined with the already existing thrombocytopaenia and coagulopathy of HELLP syndrome, results in greater haemorrhagic complication and increased transfusion requirements.

The frequency of oliguria was also significantly high in the caesarean section group (28 [18.1%]) than the vaginal delivery group (5 [6.3%]) (p=0.014). The possible cause behind this difference could be due to the haemodynamic instability and decreased perfusion of the kidney during the perioperative period, along with the nephrotoxicity effect of the anaesthetic agent, which causes renal dysfunction in the patient's kidney with HELLP syndrome.

Hypertensive crisis was much common in the case of caesarean section group, as in 39 (25.2%) of the subjects hypertensive crisis was detected whereas, in vaginal delivery group, it occurred in 8 (10.0%) subjects only (p=0.006). The stress of surgery associated with caesarean section results in an increase in catecholamines leading to sympathetic stimulation, which in turn raises blood pressure in those patients suffering from endothelial dysfunction and vasospasm.

Hospitalization was observed for a relatively long time among women who had a cesarean delivery (49 patients, 31.6%) compared to women who delivered vaginally (16 patients, 20.0%). However, this difference is statistically non-significant (p = 0.059). Such a finding can be explained by the fact that long hospitalization of women with HELLP syndrome depends on the severity of the condition itself and not necessarily on the type of delivery since both groups require close medical attention after birth.

In the present study, caesarean section was the predominant mode of delivery, being performed in 155 (66.0%) patients. This finding is in agreement with Paudyal et al. 13 who reported caesarean delivery in 61.36% of HELLP syndrome patients, and with Huang et al. 14 who reported an even higher caesarean rate of 96% in HELLP syndrome complicated by severe pre-eclampsia, reflecting the clinical tendency to opt for operative delivery in haemodynamically compromised patients. Similarly, Arusi et al. 15 reported caesarean delivery in 47.5% of HELLP cases, which is somewhat lower than the present study findings, and this difference may be attributed to variations in institutional protocols and disease severity at the time of presentation. In contrast, Padmini et al.16 reported that 83.3% of their HELLP patients delivered vaginally, which is considerably different from the present study, and this discrepancy may relates to the fact that majority of their cases were classified as partial HELLP with less severe disease requiring urgent operative intervention.

Blood transfusion was required in 80 (34.0%) patients in the present study and was significantly more frequent in caesarean section group as compared to vaginal delivery group, being 62 (40.0%) versus 18 (22.5%) respectively (p=0.007). This finding is comparable to Noor et al. 17 who reported blood transfusion requirement in 25% of their 70 HELLP patients, and Padmini et al. 16 who reported blood products administration in 54.1% of cases, with the higher rate in latter study likely reflecting more aggressive transfusion thresholds and greater proportion of patients with significant thrombocytopaenia. The increased transfusion requirement in caesarean section group observed in the present study can be attributed to the additive effect of surgical blood loss on the pre-existing haematological derangements characteristic of HELLP syndrome.

Hypertensive crisis was observed in 47 (20.0%) patients overall and was significantly more common in those delivered by caesarean section compared to vaginal delivery, being 39 (25.2%) versus 8 (10.0%) respectively (p=0.006). Zuberi et al. 18 similarly demonstrated that diastolic blood pressure exceeding 120 mmHg occurred in 61% of HELLP patients compared to 16% in non-HELLP patients (p=0.01), highlighting the severe hypertensive burden associated with HELLP syndrome regardless of mode of delivery. The higher rate of hypertensive crisis in caesarean group in the present study may be explained by the perioperative sympathetic stress response which exacerbates the underlying vasospasm and endothelial dysfunction via catecholamine-mediated

mechanisms.

Oliguria was noted in 33 (14.0%) patients and was significantly higher in caesarean section group with 28 (18.1%) cases compared to only 5 (6.3%) in vaginal delivery group (p=0.014). This is consistent with findings of Arusi et al. 15 who reported acute kidney injury as the most frequent complication in 24.8% of HELLP patients, and Noor et al. 17 who documented acute renal failure in 17% of their study population. The higher incidence of oliguria in caesarean group in the present study may be attributable to intraoperative hypotension, nephrotoxic effects of anaesthetic agents and the already compromised renal perfusion that characterises HELLP syndrome, all of which collectively impairs renal tubular function in the perioperative period.

Prolonged hospitalisation was observed in 65 (27.7%) patients and although it was numerically higher in caesarean section group 49 (31.6%) compared to vaginal delivery group 16 (20.0%), this difference did not reach statistical significance (p=0.059). Gupta et al. 19 reported mean hospital stay of 11.67±6.50 days in true HELLP patients and 7.77±3.36 days in severe pre-eclampsia without HELLP, suggesting that disease severity rather than mode of delivery is the primary determinant of hospitalization duration,20 which may explain the non-significant finding observed in the present study.

There are some limitations associated with the current study that should be discussed. First, the study was carried out at one tertiary health facility, hence the results cannot be generalized in other settings in the country. Second, the sample size of 235 patients was calculated on the basis of the expected number of cases requiring blood transfusion. This may reduce the power of statistics for evaluation of other outcomes related to maternal morbidity such as oliguria and hypertensive crisis. Third, data was collected through hospital record and follow-up of the patients till discharge; however, any complications arising in the patient during the post-discharge period could not be included in the study. Fourth, the current study does not make a distinction between elective and emergency cesarean section; however, the urgency of surgery is an important factor affecting maternal morbidity in the case of cesarean section group.

CONCLUSION

Conclusion of the current study indicates that caesarean delivery was the most prevalent method of delivery in patients with HELLP syndrome and was also seen to be associated with significantly higher rates of serious maternal complications than vaginal delivery. Significant occurrence of blood transfusion, oliguria and hypertensive crisis was found in the caesarean delivery group, which suggests that delivery by operation in cases of HELLP syndrome is associated with a much higher incidence of maternal morbidity.

Ethical Approval

Prior to commencement of data collections all necessary ethical approvals were obtained from the Institutional Ethical Committee of the concerned hospital and the study was conducted in full accordance with the approved ethical guideline.

Patients' Consent

All the participant who were enrolled in this study has provided their written informed consent before inclusion and data collection was not started until consent was properly obtained from each patient.

Competing Interests

None of the author has any financial or personal competing interests that could have influences the conduct, analysis or reporting of the present study

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