# Perinatal Outcomes in HELLP Syndrome

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**Received 25 May 2007; received in revised form 11 November 2007; accepted 18 December 2007; published online 12 June 2008**

## Abstract

**Objective:** The HELLP (hemolysis, elevated liver enzymes, and low platelet count) syndrome is a severe complication of pre-eclampsia with high risk for mother and fetus. This study was conducted to evaluate the incidence of serious maternal and fetal morbidities and adverse outcomes in women with HELLP syndrome.

**Materials and Methods:** Totally 64 pregnancies complicated by HELLP syndrome managed between January 1, 2000 and August 31, 2006 were reviewed. The demographic data, presenting signs and symptoms, and laboratory findings were evaluated. We recorded the adverse maternal outcomes including eclampsia, abruptio placenta, disseminated intravascular coagulopathy (DIC), acute renal failure (ARF), pulmonary complications, the need of mechanical ventilation, severe ascites, the need for transfusion, intracranial infarct or hemorrhage, and maternal death. Perinatal complications including IUGR, oligohydramniosis, fetal distress, Apgar score in first and fifth mins <7, respiratory distress syndrome, sepsis, convulsion, and perinatal death were also reported.

**Results:** Gestational age at delivery ≤28 weeks' gestation was in 21.9% of the cases. Forty-three patients (67.2%) had no antenatal care. Acute renal failure (25%), pulmonary complications (25%), and eclampsia (23.4%) were the most common complications. There were five maternal deaths in 64 patients with HELLP syndrome. The most common primary cause of maternal death was multiple organ failure. All of the maternal deaths had platelet level less than 50 000 per µl. Fetal and neonatal mortality rates were 18.8% and 20.3%, respectively.

**Discussion:** We concluded that the incidence of serious maternal and fetal morbidities and mortalities are increased in HELLP syndrome. For this reason adequate and prompt diagnosis and management is crucial in patients with HELLP syndrome.

**Key words:** HELLP syndrome, maternal morbidity, maternal mortality, perinatal complications, pregnancy

## Özet

### HELLP Sendromunda Perinatal Sonuçlar

**Amaç:** HELLP (hemolysis, elevated liver enzymes, and low platelet count: hemoliz, karaciğer enzim yükselmesi ve düşük trombosit sayısı) sendromu, anne ve fetüs için preeklampsinin ciddi bir komplikasyonudur. Bu çalışmada, HELLP sendromlu gebelerde ciddi maternal ve fetal morbidite ile komplikasyonların değerlendirilmesi amaçlandı.

**Materyal ve Metot**: Bu çalışmada 1 Ocak 2000 ve 31 Ağustos 2006 tarihleri arasındaki toplam 64 HELLP sendromlu gebe incelendi. Demografik veriler, başvuru semptomları ve laboratuvar bulguları değerlendirildi. Eklampsi, ablasyo plasenta, disemine intravasküler koagülopati (DİK), akut böbrek yetmezliği (ABY), pulmoner komplikasyonlar, mekanik ventilasyon ihtiyacı, ciddi asit, transfüzyon ihtiyacı, intrakraniyal enfarkt ya da kanama ve maternal ölüm gibi maternal komplikasyonlar kaydedildi. İntrauterin gelişme geriliği oligohidroamniyoz, fetal distres, 1. ve 5. dakika Apgar skoru <7, yenidoğan solunum sıkıntısı sendromu, sepsis, konvülziyon ve perinatal ölüm kaydedildi.

**Sonuçlar:** Gestasyonel yaşın 28 haftadan küçük olması tüm vakaların %21.9'unda görüldü. Kırk üç hasta (%67.2) antenatal bakım almamıştı. ABY (%25), pulmoner komplikasyonlar (%25) ve eklampsi (%23.4) en sık görülen komplikasyonlardı. Toplam

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64 HELLP sendromlu hastada beş maternal ölüm gözlendi. Maternal ölümlerin en sık nedeni çoklu organ yetmezliği idi. Bütün maternal ölümlerde trombosit sayısı 50 000 per µl'nin altında idi. Fetal ve neonatal mortalite oranları ise %18.8 ve %20.3 idi.
**Tartışma:** HELLP sendromunda ciddi maternal ve fetal morbidite ve mortalite insidansı artmıştır. Bu yüzden HELLP sendromlu hastalarda erken tanı ve tedavi hayati önem taşımaktadır.

**Anahtar sözcükler:** HELLP sendromu, maternal morbidite, maternal mortalite, perinatal komplikasyonlar, gebelik

## Introduction

The HELLP syndrome, originally described by Weinstein as an acronym in 1982, includes signs of hemolysis (H), elevated liver enzymes (EL), and low platelet count (LP), and is a variant of presentation of severe preeclampsia (1). The incidence of HELLP syndrome in women with severe preeclampsia and eclampsia ranges from 2 to 30% depending on the population studied and the criteria used to establish the diagnosis (2). The reported maternal mortality of the HELLP syndrome ranges from 0 to 24% and the perinatal mortality ranges from 8 to 37% (3-5). Optimal maternal and fetal outcomes are dependent on prompt recognition and treatment of HELLP syndrome (6). Severe HELLP has been shown to increase maternal and perinatal morbidity and mortality rates (7).

This study was conducted to evaluate the incidence of serious maternal and fetal morbidities and adverse outcomes in women with HELLP syndrome.

## Materials and Methods

We reviewed the patients with HELLP syndrome admitted to obstetric clinic in a university hospital between January 2000 and August 2006 retrospectively. We recruited all the patients with HELLP syndrome in the study period. The diagnosis of HELLP syndrome required the presence of thrombocytopenia (perinatal platelet ≤150 000 per µl), evidence of hepatic dysfunction (increased aspartate aminotransferase level of ≥70 IU/L, increased Alanine aminotransferase level of ≥70 IU/L, or both, with increased lactate dehydrogenase [LDH] level of ≥600 IU/L), and evidence of hemolysis (increased LDH level, progressive anemia), usually in association with hypertension or proteinuria considered to represent preeclampsia or eclampsia (8). The exclusion criteria were hypertension and proteinuria before the 20$^{th}$ gestational week and other significant medical conditions, including renal, hepatic, hematologic or cardiovascular diseases and diabetes mellitus that could cause proteinuria and hypertension and multiple pregnancies.

We collected the demographic data and clinical findings including maternal age, parity, prenatal care, history on gestational hypertension, gestational age at admission, and systolic and diastolic blood pressures at admission and highest during the management, the ratio of postpartum HELLP syndrome, signs and symptoms, the duration of stay at the hospital. Routine laboratory evaluation included liver function tests (aspartate aminotransferase and alanine aminotransferase), complete blood cell count, coagulation profile (platelet count, prolonged prothrombin time, and partial thromboplastin time), and renal function tests (blood urea nitrogen and creatinine). We recorded the adverse maternal outcomes including eclampsia, abruptio placenta, disseminated intravascular coagulopathy (DIC), acute renal failure (ARF), pulmonary complications (pulmonary edema and pulmonary infection), the need of mechanical ventilation, severe ascites, the need for transfusion, intracranial infarct or hemorrhage, and maternal death. Perinatal complications including IUGR, oligohydramniosis, fetal distress, Apgar score in first and fifth minute <7, respiratory distress syndrome, sepsis, convulsion, and perinatal death were also reported.

Gestational age was determined according to last menstrual period or ultrasonography at <20 weeks' gestation. The diagnosis of severe preeclampsia was made according to American College of Obstetricians and Gynecologist criteria (7). Preeclampsia was defined as the development of hypertension plus one of following: proteinuria, thrombocytopenia, or pulmonary edema after the 20$^{th}$ gestational week. Eclampsia was defined as tonic-clonic seizures occurring in a hypertensive pregnancy, with or without proteinuria. Proteinuria was defined as excretion of >300 mg of protein in a 24 h urine collection, or two dipstick test results of >2 + (>100 mg/dl), the values being recorded at least 4 hours apart with no evidence of urinary tract infection. Pulmonary edema was diagnosed based on clinical findings and chest radiograph. DIC was defined as the presence of three or more of the following criteria: low platelets (<100 000 per µl), low fibrinogen (<300 mg/dl), positive D-dimers (≥50 mg/dl), or prolonged prothrombin (≥14 seconds) and partial thromboplastin (≥40 seconds) times. IUGR was defined as birth weight less than fifth percentile (9). Acute renal failure was diagnosed in the presence of oliguria or anuria in association with a creatinine clearance of ≤20 ml/min or an elevated serum creatinine level of ≥2 mg/dl. The diagnosis of severe ascites was made by estimation during ultrasonographic examination or cesarean delivery or laparotomy (presence of ≥1000 ml fluid measured by suction apparatus). Acute respiratory distress syndrome (ARDS) was defined in accordance with the definition established by the American-European Consensus Conference on ARDS (10).

Patients with HELLP syndrome routinely received magnesium sulfate intravenously (15% in 10 ml, Biosel, Istanbul, Turkey)

to prevent and control convulsions. The patients were administered loading dose of magnesium sulfate (6 grams) over 20 minutes, followed by maintenance dose of 1-2 g/h. Continuous infusions of sodium nitroprusside (Nipruss, Adeka, Samsun, Turkey) or glyceryl trinitrate (Perlinganit, 10 mg, Adeka, Samsun, Turkey) were administered to control severe hypertension (11). "Dexamethasone rescue therapy" was used in patients with HELLP syndrome (12). Pregnant women with HELLP syndrome received dexamethasone 10 mg intravenously every 12 hours until delivery and 3 additional doses after delivery. Blood or blood products were administered as needed to correct severe anemia or coagulation abnormalities. The criteria for red blood cell transfusion were <8 g/dl (<24% HCT) and the criteria for platelet transfusion were blood platelet count <50 000/µl and either significant active bleeding. At ≤34 weeks' gestation, the patient was given betamethasone disodium phosphate (Celestone amp, 3 mg, Eczacıbaşı, Istanbul, Turkey) 12 mg/day for 2 days to enhance fetal lung maturity and then delivered 48 hours later if possible. Data were presented as mean ±SD or the median (min-max) and percentage.

## Results

During the study period, 64 women met the strict criteria for HELLP syndrome. Table 1 summarizes the demographic data and the presenting symptoms of women with HELLP syndrome. The maternal age range was 17 to 46 years. Gestational age at delivery ≤28 weeks' gestation was in 21.9% of the cases. Forty-three patients (67.2%) had no antenatal care. Table 2 lists the laboratory findings in these patients with HELLP syndrome.

Table 3 shows the serious maternal complications in our population with HELLP syndrome. Acute renal failure (ARF) and pulmonary complications including pulmonary edema and infection were the most frequent complications followed by eclampsia. The ratios of some outcomes were as follows: DIC, 17.2%; reoperation, 6.3%; intracranial infarct, 3.1%; and sepsis 3.1%. In all patients with those serious complications were treated by mechanical ventilation, blood and blood product transfusions, hemostasis and antibiotherapy as indicated in intensive care unit conditions. Forty-eight women required transfusion of blood products including platelet, red blood cell, fresh frozen plasm (FFP), or complete blood cell transfusions in which 40 patients (62.5%) were administered platelet and

**Table 1.** Demographic data and clinical findings

| | Value |
|---|---|
| Maternal age (y, mean ±SD) | 29.8±6.9 |
| Gestational age (wk, mean ±SD) | 32.2±3.9 |
| Nulliparous [n, (%)] | 23 (35.9) |
| Ratio of postpartum HELLP [n, (%)] | 9 (14.1) |
| Antenatal care [n, (%)] | 21 (32.8) |
| Gestational hypertension history [n, (%)] | 13 (20.3) |
| Initial systolic blood pressure (mmHg) (median, min-max) | 150 (140-250) |
| Initial diastolic blood pressure (mmHg) (median, min-max) | 100 (90-140) |
| Highest systolic blood pressure (mmHg) (mean ±SD) | 177.8±33.9 |
| Highest diastolic blood pressure (mmHg) (mean ±SD) | 113.7±7.3 |
| Headache [n, (%)] | 13 (20.3) |
| Epigastric pain [n, (%)] | 19 (29.7) |
| Chest pain [n, (%)] | 11 (17.2) |
| Severe edema [n, (%)] | 30 (46.9) |
| Nausea and/or vomiting [n, (%)] | 10 (15.6) |
| Visual changes [n, (%)] | 9 (14.1) |
| Severe proteinuria [n, (%)] | 18 (28.1) |
| Oligoanuria [n, (%)] | 14 (21.9) |
| Hematuria [n, (%)] | 3 (4.7) |

Severe edema, (+++) tibial edema and/or edema in the face and hands.
Severe proteinuria, proteinuria greater or equal to 5 gm/24 hours.

**Table 2.** Laboratory findings in HELLP syndrome

| | Value |
|---|---|
| Aspartate aminotransferase (AST) (IU/L) (median, min-max) | 215 (70-9856) |
| Alanine aminotransferase (ALT) (IU/L) (median, min-max) | 144.5 (70-5904) |
| Lactic dehydrogenase (LDH) (IU/L) (median, min-max) | 1189.5 (600-19196) |
| Blood urea nitrogen (BUN) (mg/dl) (median, min-max) | 15.5 (3-153) |
| Creatinine (mg/dl) (Cr) (median, min-max) | 1.1 (0.5-7) |
| Hemoglobin (g/dl) (mean ±SD) | 10.8±2.7 |
| Leukocyte count ($10^3$/µl) (mean ±SD) | 17.4±7.2 |
| Platelet count ($10^3$/µl) (mean ±SD) | 60.8±29.3 |
| Platelet transfusion (median, min-max) | 2 (1-7) |
| Red blood cell transfusion (median, min-max) | 2 (1-14) |
| Fresh frozen plasm (median, min-max) | 2 (1-20) |

AST, 15-41 IU/L; ALT, 17-63 IU/L; LDH, 125-240 IU/L; Cr, 0.7-1.2 mg/dl;
BUN, 8-20 mg/dl were the normal ranges of our laboratory.

**Table 3.** Serious maternal complications in HELLP syndrome

| Complications [n, (%)] | Value |
|---|---|
| Acute renal failure | 16 (25) |
| Pulmonary complications (pulmonary edema/infection) | 16 (25) |
| Eclampsia | 15 (23.4) |
| Mechanical ventilation | 12 (18.8) |
| Disseminated intravascular coagulopathy (DIC) | 11 (17.2) |
| Severe ascites | 9 (14.1) |
| Ablatio placenta | 7 (10.9) |
| Acute Respiratory Distress Syndrome (ARDS) | 7 (10.9) |
| Maternal death | 5 (7.8) |
| Reoperation | 4 (6.3) |
| Intracranial infarct | 2 (3.1) |
| Sepsis | 2 (3.1) |
| Intracranial hemorrhagia | 1 (1.6) |
| Uterine rupture | 1 (1.6) |

FFP transfusions and 17 patients (26.6%) were administered red blood cell transfusions.

Four patients were reoperated to control the postoperative intraabdominal hemorrhage. Hematuria was observed in three patients complicated by DIC. The data about the blood and blood products transfused to complicated patients were shown in Table 2.

There were five maternal deaths in 64 patients with HELLP syndrome. The most common primary cause of maternal death was multiple organ failure. All of the maternal deaths had platelet level less than 50 000 per µl. All of the pregnancies with maternal death were complicated with ARF and fetal demise. Two of the patients had antepartum HELLP syndrome and sepsis. One had reoperation for abdominal hemorrhage before death. There were no deaths in the group of patients complicated with intracranial hemorrhage or stroke.

Table 4 lists serious perinatal complications in HELLP syndrome. The ratios of IUGR and oligohydramniosis were 54.7% and 46.9%, respectively. The most common neonatal complication was respiratory distress syndrome (23.4%). Fetal and neonatal mortality were as follows: 18.8% and 20.3%, respectively.

**Table 4.** Perinatal complications in HELLP syndrome.

| Complications [n, (%)] | Value |
|---|---|
| IUGR | 35 (54.7) |
| Oligohydramniosis | 30 (46.9) |
| Fetal distress | 29 (45.4) |
| Apgar score in first min <7 | 36 (56.3) |
| Apgar score in fifth min <7 | 24 (37.5) |
| Fetal death | 12 (18.8) |
| Respiratory distress syndrome | 15 (23.4) |
| Sepsis | 5 (7.8) |
| Convulsion | 7 (10.9) |
| Neonatal mortality | 13 (20.3) |

IUGR: intrauterine growth retardation.

## Discussion

Herein we found that the incidence of acute renal failure, pulmonary complications, and disseminated intravascular coagulopathy were higher in the patients with HELLP syndrome. The high incidence of maternal and death in our population was the consequence of patients complicated with multiple organ failure.

One of the eligibility of this study for evaluating the outcomes and the risk factors for HELLP syndrome that all of our data are from a single tertiary care medical center that used the same criteria to diagnose the HELLP syndrome and the same protocols for management of the HELLP syndrome. Another advantage of this study is that our perinatal center serves as the main referral center for the population of 1 000 000 inhabitants. Many patients were referred because of significant complications. The pregnancies with HELLP syndrome who are remote from term should be transferred to a tertiary referral centre when the maternal condition is stable. On the contrary, patients with "mild" presentations of HELLP syndrome or uncomplicated were not referred to our hospital. It is our belief that these factors might explain the discrepancy in the ratio of maternal and fetal morbidity and mortality between our study and those reported previously (13,14). One reason which could be possible for the higher complication rates could be the high rate of the patients without antenatal care (67.2%) in our study. Antenatal care in all pregnant patients should be encouraged for the early diagnosis of the hypertensive disease of pregnancy and diminishing the rate of complications in those patients.

HELLP syndrome has classically been described as a disease process that occurs more often in older multigravid women than in younger nulliparous women with typical preeclampsia (15,16). In our study, the average maternal age and the ratio of nulliparity in our study population were 29.8±6.9 years and 35.9%, respectively, which were compatible with the values in a previous study (15). The history of pregnancy induced hypertension was also similar with the ratio of previous studies (15).

The development of HELLP syndrome is associated with an increased risk of adverse maternal outcomes (8). Acute renal dysfunction, the most common adverse outcome in our study population, was noted in 25%, which was compatible with the other Turkish study (36%) (17) and higher than the frequency in the other previous study (53.8%) (18). On the other hand, several studies have reported the incidence of acute renal failure only 5-7% (19,20). The overall incidence of pulmonary complication in our study (25%) was higher than that of the outcome in the study by Sibai et al. (13%) (19). Particularly pulmonary edema might be explained by the high ratio of renal dysfunction and the generalized edema in our population. One of the serious pulmonary complication, ARDS, was diagnosed in 7 cases (10.9%), it was also more frequent in our results than that of Sibai et al (19) (1%) and Celik et al. (3%) (17). The ratio of patients required mechanical ventilation was 18.8% due to ARDS, intracranial pathologies or pulmonary complications. The incidence of eclampsia (23.4%) was higher than that of the previous studies (19,20). We found the laboratory evidence of disseminated intravascular coagulopathy in 17% patients with HELLP syndrome.

In our results, maternal death was caused by a variety of pathologic conditions. Not surprisingly, many of these conditions have included hemorrhagic complications such as disseminated intravascular coagulopathy and vascular disorders to the cardiopulmonary or renal system. In this series, patients had multiple contributing factors to their deaths almost without exception. It certainly appears that most maternal deaths occurred among women with multiple organ failure including disseminated intravascular

coagulopathy, acute renal failure, pulmonary complications and sepsis.

There is general agreement that perinatal and infant morbidity and mortality rates are increased in pregnancies complicated by the HELLP syndrome (21,22). In our study, the frequencies of fetal morbidity and mortality were 54.7% and 18.8%, respectively. Neonatal morbidity and mortality were 42.1% and 20.3%, respectively. We concluded that perinatal outcome was poor and comparable with the previous studies (22,23). Before 34 weeks, the woman should be delivered if the condition cannot be controlled rapidly (24). A woman with moderate HELLP syndrome at a gestational age greater than 34 weeks after fetal pulmonary maturation should be delivered immediately. The patient and the baby must be assessed continually during this period and she should be delivered if her condition worsens.

HELLP syndrome is a condition that is associated with severe maternal and fetal morbidity and mortalities. We suggest the following guidelines to improve the maternal and fetal outcomes: (1) to hospitalize pregnant patients with the symptoms of preeclampsia might decrease the incidence of the admissions of the patients with the HELLP syndrome, (2) the patients with HELLP syndrome should be treated with aggressive multidisciplinary approach, (3) the patients with the history of HELLP syndrome should be informed that they might be in high risk in their future pregnancies and those pregnancies should be followed in the obstetric clinics.

We suggest the criteria for the discharge of the patients with HELLP syndrome from the intensive care unit; 1) increase in the platelet count, 2) decrease in the serum LDH levels, 3) improvement in the urine output, 4) regulation of hypertension, 5) to obtain the recovery in the clinical signs and symptoms, 6) absence of serious complications. We concluded that the incidence of serious maternal and fetal morbidities and mortalities are increased in HELLP syndrome. Adequate and prompt diagnosis and management is crucial in patients with HELLP syndrome.

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