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Maternal and Fetal Outcomes of Patients with HELLP Syndrome

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Shazia Shah[1], Rehana Kamal[2], Ifrah Rameen[3], Aisha Siddiqa[4],Dr. Hadiqa[5], Dr.Shazia[6]

1. Postgraduate Student, Department of Obstetrics & Gynecology, Sandeman Provincial Hospital, Quetta
2. Associated professor, Department of Obstetrics & Gynecology, Sandeman Provincial Hospital, Quetta
3. Postgraduate Student, Department of Obstetrics & Gynecology, Sandeman Provincial Hospital, Quetta
4. Professor, Ex-Head of Obstetrics & Gynecology Department, Bolan Medical College, Quetta
5. WMO sarhad government hospital for psychiatric diseases
6. Category D hospital Munda, Dir lower, KPK

ABSTRACT:

Objective: To determine the maternal and fetal outcomes of patients with HELLP syndrome.
Methods: This cross-sectional study was conducted at the Department of Obstetrics & Gynecology, Sandeman Provincial Hospital, Quetta, from June 1st to November 30th 2025, using non-probability consecutive sampling. Pregnant women aged 18 to 35 years, above 24 weeks of gestation, diagnosed with HELLP syndrome were included regardless of gravida status. Those with hepatic disease, hemolytic anemia, platelet disorders, chronic hypertension, or chronic renal disease were excluded to avoid bias. After ethical approval, eligible inpatients were enrolled. Data collection involved clinical evaluation and lab tests, including blood counts, coagulation profiles, liver and renal function tests. Disseminated intravascular coagulation was diagnosed by platelet counts and coagulation parameters. Ultrasound and ophthalmoscopy (if severe) were performed. Magnesium sulfate was used for seizure control; blood pressure was managed with labetalol or nifedipine. Blood products and antenatal steroids were administered as needed. Fetal monitoring included biophysical profiles and Doppler. Pregnancy management decisions were based on maternal and fetal status. Patients were cared for in HDU or ICU if necessary. Data were recorded on a pre-designed proforma, with strict exclusion to reduce confounding.

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Results: Out of 117 pregnant women diagnosed with HELLP syndrome, 38.5% resided in urban areas and 61.5% in rural areas, indicating higher prevalence in rural settings. The mean age was 23.9 ± 3.1 years, weight 52.6 ± 7.3 kg, height 155.5 ± 7.4 cm, and BMI 21.9 ± 3.7 kg/m². Mean gestational age at diagnosis was 32.6 ± 2.9 weeks. Primigravida women accounted for 36.8%, multigravida 63.2%. Maternal outcomes included pre-eclampsia (41.9%), postpartum hemorrhage (26.5%), placental abruption (22.2%), and maternal death (9.4%). Fetal outcomes showed preterm birth (40.2%), low birth weight (25.6%), IUGR (23.9%), and respiratory distress syndrome (10.3%). Educationally, 20.5% had primary, 25.6% secondary, 32.5% intermediate, and 21.4% graduate levels. Most women (66.7%) belonged to the lower socioeconomic class. Significant associations existed between place of residence and maternal (p=0.040) and fetal outcomes (p=0.038), with rural women facing more severe complications. No significant associations were found with gravida status or socioeconomic status. Educational status was significantly linked to fetal outcomes (p=0.016), with lower education correlating with worse fetal health. Gestational age categories showed no significant effect on outcomes, despite clinical trends. These findings highlight rural residence and education as key factors influencing HELLP syndrome outcomes.

Conclusion: It shows that the HELLP syndrome is associated with both a high maternal and fetal morbidity, being worse for rural women and those with lower levels of education. Greater contribution of social variables. Since gravidity, socioeconomic status, gestational age, and maternal age were less significant compared to the role of some social factors. Improved maternal health literacy and prenatal care, especially in impoverished areas, may explain the reduced morbidity from HELLP syndrome.

Keywords:HELLP Syndrome**,** Maternal Outcome,Fetal Outcome,Pregnancy Complications.

Introduction:

Hypertensive disorders of pregnancy (HDP) are one of the most prominent medical challenges of pregnancy among both mothers and fetuses across the world. One of them is the HELLP syndrome (Hemolysis, Elevated Liver enzymes, Low Platelet count): it is a life-threatening disorder in severe cases and a threatening illness both to mothers and babies(1). Strictly speaking, it is a rare syndrome (estimated incidence: 0.5-0.9 per any million pregnancies), but its maternal mortality/morbidities are very disproportionate in countries, not due to the lack of proper medical infrastructure, but due to their lack at the time when they are needed, depending on the indication(2). The consequences of a HELLP syndrome deposition in Pakistan are even greater,

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and this augmented incidence magnitude adds to the maternal and perinatal mortality already causing alarm, resulting in an additional motivation to place it in the spotlight of enhanced clinical suspicion and better management(3).

The HELLP syndrome has far-reaching maternal consequences that are devastating. Women who develop this syndrome can have more than one organ system affected, and the complications can include: disseminated intravascular coagulation (DIC), acute renal failure, pulmonary edema, placental abruption, and death(4). In the vast majority of cases, the clinical picture is also unpredictable and sometimes progressive, with a very rapid course, necessitating rapid diagnosis and treatment. Even though there has been some movement in the obstetric care setting since 1990, these complications are a major cause of maternal mortality in the Pakistani setting, with inequitable access to healthcare, presentation of complications at too late a stage, and poor antenatal coverage exposing women to developing the complications(5). Some of the factors that lead to the worsening of the outcomes are a slow referral system and, lack of access to specialized care, especially in rural and underdeveloped regions(6).

Concerns also exist about what the fetus should know about the complications posed by the pregnancies caused by the HELLP syndrome. The syndrome has a pathological impact on the placenta that is usually characterized by IUGR (intrauterine growth restriction), preterm birth, low birth weight, and perinatal death(7). The most far-reaching effects are those that cause premature babies, usually as a consequence of the necessity to kill one child out of the necessity to save the life of the other child. Regrettably, premature infants are also prone to respiratory complications, infection, and developmental retards later on. Pakistan is still faced with a huge problem of neonatal mortality, and most of the neonatal deaths are attributed to complications such as prematurity and low weight at birth, which are closely related to hypertensive conditions such as the HELLP syndrome(8). Added to this issue is the lack of proper access to neonatal care, and most families were facing economic barriers that prevented them from accessing early care for their newborn babies(9).

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The HELLP syndrome is a source of disease burden in Pakistan. Mothers' mortality rates in the country vary between 186 to 100,000 live births, which is very high in comparison to the international standards. This toll is aggravated by hypertensive syndromes, including the HELLP syndrome(10). The context of inequalities in the health care system, low socioeconomic status (SES), and the absence of health resources is one of the most common settings where early detection and treatment of these morbidities are often neglected. In addition, the delay of diagnosis was caused by the low knowledge of pregnant women on danger signs and antenatal care, particularly where the disease was at an advanced stage. It has always been among the causes of maternal morbidity and mortality in the Pakistani population(11).

Epidemiologically, but to under-reporting and misdiagnosis in HELLP syndrome, there are no official national prevalence levels, studies in the hospital show that preeclampsia-HELLP syndrome is an important percentage of severe preeclampsia and eclampsia cases. HELLP syndrome was found to be more common among the women who were admitted with hypertensive disorders of pregnancy, with an incidence rate of 10-20% more than that of the disease(12). This weight is then turned into a major health problem in society, where the affected women have a higher risk of poor outcomes unless proper plans and interventions are implemented within a timeframe. The incidences of neonatal mortality as per the reports of the HELLP syndrome in the above studies are disastrous, not to say the least, to as high as 20% in some instances, and this shows why there is a dire need to increase antenatal support(13).

HELLP is a being by its own and not a component of the constellation. Delivery of the fetus and the placenta is the only remedy, and this is a difficult undertaking to take when there is such a trade-off between the maturation of the fetus with the long gestation and the minimization of maternal risk(14). Health care workers in Pakistan, a country that has invested in promises to reduce maternal mortality and is at the frontlines of the fight against the spread of the coronavirus, have often had to make tough choices, particularly because many women present themselves to seek care at such later stage. In addition to that, the care of women with HELLP syndrome post-

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discharge is not optimal such as in chronic hypertension and infant counseling. This policy gap exposes a number of women to various short and long-term issues and effects as far as health is concerned(15).

In Pakistan, the impact of the HELLP syndrome on both the mother and the fetus is a complicated situation and thus should be addressed. To start with, the quality of antenatal care services should be improved in such a way that hypertensive disorders are discovered at the initial stage. In case signs of the above condition are provoked by it, it can be regular urine, sugar, and blood pressure check-ups(16). The health education messages regarding the significance of antenatal care, preeclampsia symptoms and signs, and HELLP syndrome may be included in the health education campaigns targeted at women or women aged of childbearing age to come out with a problem, so that they may undergo testing or examination. Secondly, at the health care level, particularly in the rural and primary care settings, there would be necessary training on those who would be required to diagnose such complications; treatment or the need to be transferred could be handled at that. Provision of tertiary hospitals with facilities and facilities as intensive care for the mother and the neonate can also greatly help in reducing the mortality(17).

Methodology:

This was a cross-sectional study carried out at the Department of Obstetrics and Gynecology, Sandeman Provincial Hospital, Quetta, between 1st June and 30th November 2025 under a non-probability consecutive sampling technique. Women with pregnant women between the ages of 18 and 35 years, with more than 24thweeks of gestation, and pregnant women diagnosed with HELLP syndrome were included, irrespective of the state of gravida. Bias was also avoided by excluding patients clinically known to have hepatic disease, hemolytic anemia, platelet disorders, chronic hypertension, or chronic renal disease. After CPSP and the ethical review committee, the eligible inpatient women were registered. Data collection was based on the thorough clinical examination and laboratory studies (serial complete blood counts, coagulation profiles, PT, APTT, liver functioning tests, bilirubin, ALT, AST, LDH, and renal functioning tests, blood urea,

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creatinine, uric acid). The diagnosis of disseminated intravascular coagulation was made due to the low platelets, the long PT/APTT, INR, and D-dimer levels. Abdominal ultrasonogram and ophthalmoscopic examination (in severe cases) were done. The treatment of seizure prevention was done with magnesium sulfate and labetalol or nifedipine for blood pressure. Blood and blood products were used as required, and fetal lung maturity was given, where gestation was shorter than 32 weeks, using antenatal steroids. Fetal observation was done through a modified Biophysical Profile and Doppler studies. The consulting team made decisions on whether the pregnancy should continue or be terminated based on the status of the mothers and the fetus. The patients were treated at a high-dependency unit, and those who needed ventilator support or hemodynamic support were admitted to the ICU. The demographic and clinical data were documented on a pre-designed proforma, and strict adherence to the criteria of exclusion was followed in order to reduce confounding.

Results:

Out of 117 pregnant women diagnosed with HELLP syndrome, 45 (38.5%) resided in urban areas, while the majority, 72 (61.5%), were from rural areas, indicating a higher prevalence among women living in rural settings. The mean age of the patients was 23.9 ± 3.1 years. The average weight was 52.6 ± 7.3 kg, and the mean height was 155.5 ± 7.4 cm. Correspondingly, the mean Body Mass Index (BMI) was 21.9 ± 3.7 kg/m². The mean gestational age at the time of diagnosis was 32.6 ± 2.9 weeks, ranging from 27 to 37 weeks (Table 1).

Regarding obstetric history, 43 women (36.8%) were primigravida, while the majority, 74 women (63.2%), were multigravida. Maternal outcomes associated with HELLP syndrome included pre-eclampsia in 49 cases (41.9%), postpartum hemorrhage in 31 cases (26.5%), placental abruption in 26 cases (22.2%), and maternal death in 11 cases (9.4%). Fetal outcomes showed that 47 infants (40.2%) were born preterm, 30 (25.6%) had low birth weight, 28 (23.9%)

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experienced intrauterine growth restriction (IUGR), and 12 (10.3%) developed respiratory distress syndrome (RDS) (Table 1).

In terms of educational status, 24 women (20.5%) had primary education, 30 (25.6%) had completed secondary education, 38 (32.5%) had an intermediate level of education, and 25 (21.4%) were graduates. Socioeconomic status analysis revealed that the majority of the women (66.7%) belonged to the lower socioeconomic class, followed by 17.1% from the middle class, and 16.2% from the upper class (Table 1).

Socio-Demographics	**N (%) / Mean ± SD Total=117**
Place of Residence	
Urban	45 (38.5%)
Rural	72 (61.5%)
Anthropometric measurements	
Age (in years)	23.9 ± 3.1
Weight (in kg)	52.6 ± 7.3
Height (in cm)	155.5 ± 7.4
BMI (kg/m²)	21.9 ± 3.7
Gestational Age (weeks)	32.6 ± 2.9 (range: 27–37)
Gravida	
Primigravida	43 (36.8%)
Multigravida	74 (63.2%)
Maternal Outcomes	
Pre-eclampsia	49 (41.9%)
Postpartum Hemorrhage	31 (26.5%)
Placental Abruption	26 (22.2%)
Maternal Death	11 (9.4%)
Fetal Outcomes	
Preterm Birth	47 (40.2%)

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Low Birth Weight	30 (25.6%)
Intrauterine Growth Restriction (IUGR)	28 (23.9%)
Respiratory Distress Syndrome (RDS)	12 (10.3%)
Educational Status	
Primary	24 (20.5%)
Secondary	30 (25.6%)
Intermediate	38 (32.5%)
Graduate	25 (21.4%)
Socioeconomic Status	
Lower	78 (66.7%)
Middle	20 (17.1%)
Upper	19 (16.2%)

Table 1: Socio-demographic, Anthropometric, Obstetric, Maternal, and Fetal Characteristics of Patients with HELLP Syndrome (n = 117)

The association between various sociodemographic and obstetric variables with maternal and fetal outcomes among pregnant women diagnosed with HELLP syndrome was analyzed using Chi-square tests.

A statistically significant association was observed between place of residence and both maternal outcomes ($p = 0.040$) and fetal outcomes ($p = 0.038$). Women residing in rural areas were more likely to experience severe maternal complications such as placental abruption and maternal death, whereas urban residents more frequently presented with pre-eclampsia. Similarly, fetal complications like preterm birth and intrauterine growth restriction (IUGR) were more prevalent among women from rural areas (Table 2& 3).

There were no significant associations between gravida group (primi versus multi-gravida) and maternal outcomes ($p = 0.919$) or fetal outcomes ($p = 0.750$). This suggests that parity does not

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determine the severity or type of maternal or fetal complications in HELLP syndrome. These results suggest that there is no difference between primigravida and multigravida women in risk of poor maternal outcome of HELLP syndrome, and monitoring should be closely carried out regardless of obstetric history (Table 2 & 3).

The association between educational status and maternal outcomes approached statistical significance ($p = 0.054$), while a statistically significant association was observed with fetal outcomes ($p = 0.016$). Women with lower educational levels (primary and secondary) experienced higher rates of adverse fetal outcomes, such as low birth weight and respiratory distress syndrome. Education is often closely linked to health literacy, awareness of danger signs, and the ability to navigate and utilize healthcare services effectively. Lower education may limit a woman's ability to seek timely care or comply with medical advice, thereby contributing to worse fetal outcomes. The near-significant relationship with maternal outcomes suggests a possible trend, which may reach significance in larger samples (Table 2 & 3).

No statistically significant associations were found between socioeconomic status and maternal ($p = 0.198$) or fetal outcomes ($p = 0.305$). Despite a large proportion of patients belonging to the lower socioeconomic group (66.7%), this did not appear to significantly influence outcome measures in this sample. This may be due to the complex interplay of factors such as access to government-supported care, community health interventions, or the overriding impact of other variables (like residence and education) in determining outcomes. It's also possible that the sample size or group distribution limited the detection of a significant association (Table 2 & 3).

Further analysis examining gestational age categories (27-32 weeks vs. 33-37 weeks) revealed no statistically significant association with either maternal outcomes ($p = 0.526$) or fetal outcomes ($p = 0.240$). Although complications were present in both groups, their distribution did not differ meaningfully, suggesting that while earlier gestational age is generally linked to higher risk clinically, this was not reflected as a statistically significant difference in this sample. Notably, a

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higher incidence of respiratory distress syndrome and intrauterine growth restriction was observed among deliveries between 27-32 weeks, highlighting potential clinical relevance despite the lack of statistical significance (Table 2 & 3).

Similarly, evaluation of maternal age categories (18-24, 25-30, and 31-35 years) showed no significant association with maternal outcomes ($p = 0.272$) or fetal outcomes ($p = 0.423$). Adverse outcomes occurred across all age groups without significant variation, indicating that maternal age within this range may not have exerted a measurable influence on the outcomes studied. However, younger mothers aged 18–24 years exhibited a higher proportion of complications such as pre-eclampsia and low birthweight, suggesting clinical importance that warrants further attention despite the absence of statistical significance (Table 2 & 3).

Variables	**Categories**	**Maternal outcomes**				**Total**	**p-value**
		Postpartum Hemorrhage	Placenta Abruption	Pre-eclampsia	Death		
Place of Residence	Urban	13	4	24	4	45	0.040*
	Rural	18	22	25	7	72	
Gravida	Primigravida	13	9	17	4	43	0.919
	Multigravida	18	17	32	7	74	
Educational Status	Primary	5	7	11	1	24	0.054*
	Secondary	7	13	8	2	30	
	Intermediate	13	3	17	5	38	
	Graduate	6	3	13	3	25	
Socioeconomic Status	Upper	6	1	10	2	19	0.198
	Middle	5	8	7	0	20	
	Lower	20	17	32	9	78	
Gestational age distribution	27-32 weeks	16	12	26	8	62	0.526
	33-37 weeks	15	14	23	3	55	
Age distribution	18-24 years	17	20	31	4	72	0.272
	25-30 years	13	6	15	6	40	
	31-35 years	1	0	3	1	5	

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Table 2: Association Between Maternal Sociodemographic and Obstetric Factors and Maternal Outcomes in Patients with HELLP Syndrome

Variables	Categories	Fetal outcomes				Total	p-value
		Preterm	Low Birthweight	Respiratory Distress Syndrome	Intrauterine Growth Restriction		
Place of Residence	Urban	11	5	7	12	45	0.038*
	Rural	36	15	5	16	72	
Gravida	Primigravida	19	10	3	11	43	0.750
	Multigravida	28	20	9	17	74	
Educational Status	Primary	7	11	0	6	24	0.016*
	Secondary	15	8	3	4	30	
	Intermediate	15	4	4	15	38	
	Graduate	10	7	5	3	25	
Socioeconomic Status	Upper	5	9	1	4	19	0.305
	Middle	10	3	3	4	20	
	Lower	32	18	8	20	78	
Gestational age distribution	27-32 weeks	22	14	9	17	62	0.240
	33-37 weeks	25	16	3	11	55	
Age distribution	18-24 years	26	22	7	17	72	0.423
	25-30 years	18	6	5	11	40	
	31-35 years	3	2	0	0	5	

Table 3: Association between Maternal Sociodemographic and Obstetric Factors and Fetal Outcomes in Patients with HELLP Syndrome

Discussion:

This study reviewed sociodemographic, obstetric, and clinical attributes of pregnant women diagnosed with the syndrome of HELLP (Hemolysis, Elevated Liver Enzymes, Low Platelets) and their relationship with maternal and fetal outcomes. A number of interesting observations were made, many of which are consistent with or inconsistent with the literature, and provide information on the patterns and predictors of adverse outcomes in HELLP syndrome.

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In addition, it is noteworthy to mention that the proportion of HELLP syndrome was lower in urban (38.5%) than rural (61.5%) areas; rural area residence was significantly associated with poor maternal and fetal outcomes ($p = 0.040$ / $p = 0.038$). This is consistent with previous studies, such as that of Khan et al. (2025) and Jinga et al. (2019), who emphasized that limited access to healthcare facilities, late symptom presentation, and poor antenatal care in the rural setting result in increased complications(17, 18). Women with a rural background were more prone to have severe maternal complications (placental abruption and maternal death) and fetal outcomes (preterm birth and IUGR) in our study. On the other hand, pre-eclampsia presented more frequently in urban women (probably due to increased health-seeking and earlier detection). These discrepancies underscore that access and knowledge of healthcare matter when it comes to the results. Even if HELLP syndrome cannot be avoided in urban life, it might be easier to suspect earlier and to treat immediately, and limit the worst consequences(19).

Remarkably, there were no statistically significant differences in gravidity status (primigravida and multigravida) and the maternal or fetal outcomes, which indicates that parity is not an important factor in the prognosis of HELLP syndrome. This is comparable to the report of Li B et al. (2022), which indicated that there were no significant differences in the complications of the HELLP syndrome among the different levels of gravidity(20). Whereas there are some studies where primigravida status has been identified as a risk factor of hypertensive disorders during pregnancy, our findings support the idea that HELLP syndrome may be observed regardless of obstetric history and should be carefully observed in all pregnant women(21).

Another important determinant of fetal outcomes was the educational status ($p = 0.016$), as only women with only primary or secondary education presented higher rates of low birthweight and respiratory distress syndrome. Motherly outcomes were associated with it to a near-significant level ($p = 0.054$), indicating the possibility of a trend that may achieve statistical significance in a larger cohort. These results are congruent with other research conducted by Bello et al. (2022) and Nawabi et al. (2021), who revealed that maternal education is a key factor that determines the

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stage of health literacy as well as the use of healthcare services in a timely manner(22, 23). Highly educated women have a better chance of identifying warning signs, following antenatal care, and getting early intervention, and hence are potentially capable of decreasing the load of complications. This highlights the role of women's empowerment by educating them as a long-term approach to the enhancement of maternal-fetal health outcomes(24).

However, contrary to that, this study did not find any significant associations of socioeconomic status with maternal ($p = 0.198$) or fetal outcomes ($p = 0.305$). Although 66.7% of the respondents belonged to the lower socioeconomic backgrounds, it did not correlate with poorer performance. This result contradicts previous studies in which low socioeconomic status has been associated with adverse maternal and neonatal outcomes because of impediments to quality care (25). One possible reason why our study did not find a relationship may be the counteracting influence of the public health program or community-based intervention on the provision of antenatal care, regardless of socioeconomic status. There is also a possibility that the influence of income was covered by other variables like place of residence and educational status, which played a more significant role in determining the outcome(26).

There was no statistically significant change in gestational age at diagnosis (27-32 weeks versus 33-37 weeks) and maternal ($p = 0.526$) or fetal outcome ($p = 0.240$), which is a bit surprising because lower gestational age is typically related to poorer outcomes in HELLP syndrome, in particular, among neonates. Past studies by Kali et al. (2022) have repeatedly indicated that earlier onset of HELLP syndrome is associated with higher risks, especially because of pre-term delivery of a fetus(27). In our research, however, the frequency of RDS and IUGR was higher in the 27-32 weeks, but the frequency was found to be similar. It might be explained by the sample size constraints or successful neonatal treatments, which compensate for the projected increase in complications at preterm.

In the same manner, maternal age had no significant effect on maternal ($p = 0.272$) or fetal outcomes ($p = 0.423$), but younger mothers (1824 years) were slightly more prone to pre-

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eclampsia and low birthweight. Available literature has a mixed outcome; some sources indicate that younger maternal age is a risk factor with adverse outcomes; however, there are sources that have not reported a clear correlation(28, 29). Our findings confirm the latter, which implies that maternal age might not be a powerful predictor of the occurrence of HELLP-related complications in the age group of 18-35 years. The trend in younger mothers may, however, reflect the necessity of specific surveillance in the group, in combination with low education levels or rural population.

Conclusion:

The present analysis shows that HELLP syndrome is linked with a high morbidity burden in both the mother and the infant, and the poor outcomes were more likely to be experienced by the rural inhabitants and individuals with low education levels. These results demonstrate that social factors, access to health care, and levels of education were strong determinants of HELLP syndrome, though the other independent variables, like gravidity, socioeconomic status, gestational age, and maternal age, were not significantly correlated. The findings highlight the significance of community-based interventions that can be used to improve maternal health literacy, enhance healthcare services, and quality of prenatal care uptake, particularly in rural regions and marginalized communities. These modifiable risk factors can be controlled and remedied, and this can significantly help in alleviating maternal morbidity in the case of HELLP syndrome.

Conflict of interest: - The authors declare no conflict of interest.

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