Predisposing factors and complications associated with HELLP syndrome in the Alfredo Noboa Montenegro hospital

Factores predisponentes y complicaciones en pacientes con síndrome de HELLP del hospital Alfredo Noboa Montenegro

James Neira Esp.[1] https://orcid.org/0000-0003-2046-6572
Cristóbal Espinoza MSc.[2] https://orcid.org/0000-0001-8608-8338
Steven Buñay MD.[1] https://orcid.org/0009-0000-6219-2405
Carmen Moncayo MD.[1] https://orcid.org/0000-0001-9959-8732
Elena Orellana Msc.[3] https://orcid.org/0009-0006-9797-7628
Kety Bernárdez Msc.[3] https://orcid.org/0000-0002-2234-9735
Mirella Jara Lic.[3] https://orcid.org/0000-0003-3323-5159
Belkys Navarro Lic.[3] https://orcid.org/0009-0007-4207-5712

[1]Universidad de Guayaquil, Guayas, Ecuador.
[2]Universidad Católica de Cuenca, Grupo de Investigación, Salud, Ciencia, Innovación "ISCI", Cuenca, Ecuador
[3]Universidad Bolivariana del Ecuador, Guayas, Ecuador.
***Autor de correspondencia:** James Neira, Esp. Universidad de Guayaquil, Guayas, Ecuador. Correo electrónico: jneiraborja@yahoo.es
Received: 03/20/2025 Accepted: 06/19/2025 Published: 07/12/2025 DOI: http://doi.org/10.5281/zenodo.15741622

Resumen

Background: HELLP syndrome is a severe hypertensive disorder of pregnancy (HDP) which represents a significant diagnostic and therapeutic challenge in clinical practice. **Objective:** To assess the predisposing factors and complications associated with HELLP syndrome in patients seen in the Alfredo Noboa Montenegro Hospital (ANMH) in the Guaranda locality, in Ecuador. **Materials and Methods:** A retrospective descriptive analysis was performed with 1,253 patients who were admitted to the Gynecology and Obstetrics department of the ANMH between January and December 2022. **Results:** 75 patients were discharged with a diagnosis of one of the HDP: 49.3% with severe preeclampsia (PE), 28% with mild or moderate PE, 12% with unspecified PE, and 10.7% with HELLP syndrome. The prevalence of advanced maternal age (AMA), history of HELLP syndrome or PE in previous pregnancies, diabetes, obesity and multiparity were significant among the women who developed HELLP syndrome. **Conclusions:** HELLP syndrome is an important public health problem in our community, with AMA, history of HELLP syndrome or PE in previous pregnancies, diabetes, obesity and multiparity appearing to be important predisposing factors. This report offers a valuable epidemiological outlook on HELLP syndrome and PE for this territory, as well as other similarly rural or underserved areas in Latin America.

Keywords: HELLP syndrome, preeclampsia, hypertensive disorders of pregnancy, predisposing factors, complications.

Resumen

Antecedentes: El síndrome HELLP es un trastorno hipertensivo del embarazo (THE) grave que representa un importante desafío diagnóstico y terapéutico en la práctica clínica. **Objetivo:** Evaluar los factores predisponentes y las complicaciones asociadas con el síndrome HELLP en pacientes atendidas en el Hospital Alfredo Noboa Montenegro (HANM) en la localidad de Guaranda, Ecuador. **Materiales y Métodos:** Se realizó un análisis descriptivo retrospectivo con 1.253 pacientes que fueron ingresadas al departamento de Ginecología y Obstetricia del HANM entre enero y diciembre de 2022. **Resultados:** 75 pacientes fueron dadas de alta con diagnóstico de alguno de los THE: 49,3% con preeclampsia (PE) severa, 28% con PE leve o moderada, 12% con PE no especificada, y 10,7% con síndrome HELLP. La prevalencia de edad materna avanzada (EMA), antecedentes de síndrome HELLP o PE en embarazos previos, diabetes, obesidad y multiparidad fue significativa entre las mujeres que desarrollaron síndrome HELLP. **Conclusiones:** El síndrome HELLP es un importante problema de salud pública en nuestra comunidad, siendo la EMA, antecedentes de síndrome HELLP o PE en embarazos previos, diabetes, obesidad y multiparidad factores predisponentes importantes. Este informe ofrece una valiosa perspectiva epidemiológica sobre el síndrome HELLP y la PE para este territorio, así como para otras zonas rurales o desatendidas de América Latina.

Palabras clave: síndrome HELLP, preeclampsia, trastornos hipertensivos del embarazo, factores predisponentes, complicaciones.

Introduction

HELLP syndrome is a severe hypertensive disorder of pregnancy (HDP) which features hemolysis, elevated liver enzymes, and thrombocytopenia. It typically develops in the third trimester− although it can also emerge postpartum−and represents a significant diagnostic and therapeutic challenge in clinical practice[1]. Historically, it has been associated with advanced maternal age (AMA), previous history of HDP or HELLP, advanced maternal age, obesity, diabetes and other factors; all of which relate to placental dysfunction, immune dysregulation, and oxidative stress[2]. Worldwide, HELLP syndrome affects approximately 0.2–0.6% of pregnancies, with a high rate of maternal and perinatal complications at around 1%; and it is estimated that 25% of women with HELLP develop severe complications such as acute liver failure, acute respiratory distress syndrome, renal damage, coagulopathies, and neurological disorders[3].

The epidemiological outlook is particularly alarming in Lain America, where up to 27.6% of pregnant women with eclampsia develop HELLP syndrome, mainly manifests between weeks of gestation 27-37[4]. About 30% of these cases present within 48 hours postpartum, carrying a worse prognosis compared to cases appearing before birth[5]. Maternal mortality associated with HELLP syndrome is around 14%, notoriously due to complications such as liver failure and rupture, disseminated intravascular coagulation, respiratory distress, subcapsular hematoma, and pulmonary edema[6]. In Ecuador, the incidence according to the Ministry of Public Health is 3 per 1,000 pregnancies, accounting for 1–2% of maternal deaths and 10–35% of fetal deaths approximately[7].

Given this context, this report aims to further illuminate the epidemiological panorama of HELLP syndrome in Ecuador, by assessing the predisposing factors and complications associated with this disorder in patients seen in the Alfredo Noboa Montenegro Hospital (ANMH) in the Guaranda locality, in the Bolívar province of Ecuador.

Materials and methods

A retrospective descriptive analysis was performed to assess the frequency of various HDP and their relationship with various associated factors in pregnant women who attended the ANMH between January and December 2022. Data were collected directly from the institution's medical record database. All pregnant patients seen in the institution during this time period were included in this study. On the other hand, patients with incomplete medical records or errors in the primary data recollection; as well as those who did not fully pursue therapeutic management in the institution, were excluded from the study. Data organization and analysis was performed using Microsoft Excel software. All personal and clinical data were kept in complete confidentiality during the undertaking of this study.

Results

From January to December 2022, a total of 1,253 patients were admitted to the Gynecology and Obstetrics department of the ANMH; out of which 12% were adolescents, aged 13-18 years; 73.3% were 19-34 years of age; and 14.7% were considered of AMA, at 35 years of age or older. Regarding ethnicity, 68% of the patients identified as mixed-race, while 32% identified as indigenous. Furthermore, 52% of the patients reported coming from a rural residence, whereas 48% reported an urban residence. Out of this population, 75 patients were discharged with a diagnosis of one of the HDP: 49.3% with severe preeclampsia (PE), 28% with mild or moderate PE, 12% with unspecified PE, and 10.7% with HELLP syndrome.

Figure 1 shows that, among the women with HDP, 14.7% were of AMA. When further assessing age, in the group aged 13-18 years the prevalence of HDP by severity was: 55.6% for severe PE, 22.2% for mild-moderate PE, and 22.2% for HELLP syndrome. In the group aged 19-34 years, it was: 45.5% for severe PE, 30.9% for mild-moderate PE, and 7.3% for HELLP syndrome, and 16.4% for unspecified PE. Finally, in the group aged 35 years and older, it was 63.6% for severe PE, 18.2% for mild-moderate PE, and 18.2% for HELLP syndrome.

Likewise, 14.7% of patients with HDP also had a history of a previous pregnancy with PE or HELLP syndrome, while 65.3% denied such history, and 20% had no available information in this regard (**Figure 1**). Detailed anal-

ysis revealed this relevant history was present in 17.6% of mild-moderate PE cases, 20.7% of severe PE cases, and 16.7% of HELLP syndrome cases.

Figure 1. Prevalence of advanced maternal age and previous HELLP syndrome or preeclampsia in women with hypertensive disorders of pregnancy who attended the HANM between January and December 2022.

On the other hand, **Figure 2** illustrates that 38.7% of the women who developed a HDP had a diagnosis of type 2 diabetes, 48% did not have this diagnosis, and 13.3% had no available information. Diabetes was present in 50% of patients with mild-moderate PE, 48% of severe PE cases, 14% HELLP syndrome cases, and 44% of unspecified PE cases. Furthermore, **Figure 2** shows 41.3% of the women who were diagnosed with a HDP also were diagnosed with obesity as per their body mass index (BMI), whereas 45.3% were not obese, and 13.3% did not have their BMI assessed. Obesity was present in 50% of patients with mild-moderate PE, 48.3% of severe PE cases, 42.9% HELLP syndrome cases, and 44.4% of unspecified PE cases. Lastly, the proportions of multiparous women among the HDP cases were 52.9% among mild-moderate PE cases, 55.2% among severe PE cases, and 33.3% among HELLP syndrome cases.

Figure 2. Prevalence of diabetes and obesity in women with hypertensive disorders of pregnancy who attended the HANM between January and December 2022.

Figure 1

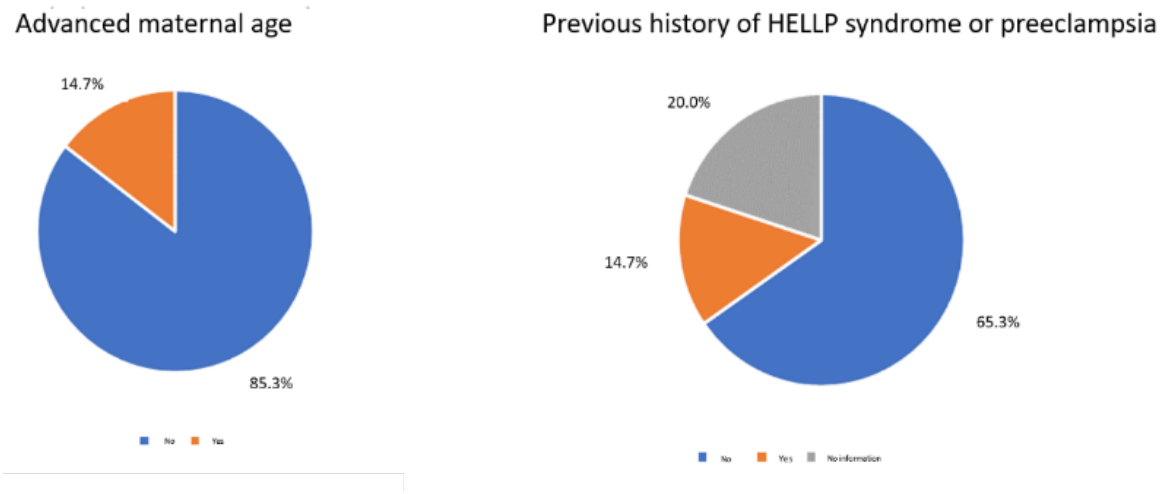
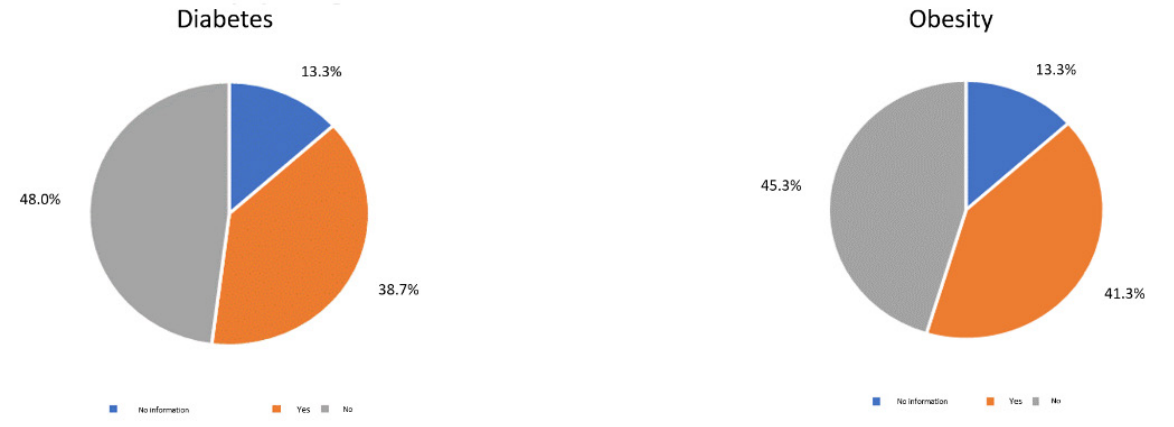


Figure 2



HELLP syndrome remains a challenging clinical entity in gyneco-obstetrical practice, as it represents a significant threat to maternal and fetal wellbeing, both immediate and long-term. Moreover, this condition belongs to the spectrum of HDP, all of which markedly contribute to maternofetal morbidity and mortality worldwide[8]. In our study, only 8 out of the 1,253 pregnant women who were seen in the ANMH between January-December 2022 were primarily diagnosed with HELLP syndrome, accounting for a 0.6% provincial incidence, which is consistent with global statistics[3]. However, many more were diagnosed with other HDP, adding complexity to the local epidemiology and highlighting their relevance as a public health issue in this context.

In our sample, 10.7% of the women who received a diagnosis of a HDP had HELLP syndrome. This is in line with findings by Adbullahi et al.[9] in a Ugandan cohort, who reported an approximate incidence of 2 out of every 10 women with PE or eclampsia. We also found a very high proportion of cases of severe PE, at 49.3%, excluding cases with HELLP syndrome. This figure is relatively high: The incidence of severe PE has been estimated to be as low as 1.3% in a low-resource hospital in Zimbabwe[10]; and as elevated as 23 out of a total of 44 patients who went on to develop eclampsia[11]. Indeed, severe PE is closely linked to a wider scope of complications. Evaluating the relationship between the prevalence of the various types of HDP and their population-based determinants may be a valuable step in implementing specific management and prevention strategies.

After assessing our patients' age, we found an important prevalence of AMA in the sample with HDP; and although severe PE was the most common in all age groups, the highest frequency was found in the group aged 35 years and older. Indeed, the link between HDP and AMA is well-established. In a large retrospective study in an urban center in the United States, Smithson et al.[12] found all forms of HDP, as well as eclampsia, were significantly more frequent in women aged 35-44 years; and these rates were at least doubled in the women aged 45 years and older. Notoriously, our findings resemble those of Maeda et al.[13] in a Japanese cohort, with a J-shaped curve depicting the an intermediate prevalence in women under 20 years of age, the lowest in those between 25-29 years, and the peak in those aged 30 and older, at 10.58%. Nevertheless, the relative proportions in our population remain much greater, underlining the importance of local factors.

We also found an important proportion of the patients in our sample reported PE or HELLP syndrome in previous pregnancies, irrespective of the severity of the current HDP. This is in harmony with previous reports: History of PE in previous pregnancies was identified as a significant risk factor for PE in subsequent pregnancies in a Cuban retrospective study[14]. Similarly, in a Norwegian population-based cohort including records from 1999 to 2014, the relative risk for HELLP syndrome was very high for women in their second pregnancy who had developed this disorder in their first pregnancy[15].

Diabetes was also closely related to PE and HELLP syndrome in our study. Preexisting diabetes has been recognized as powerful risk factor for HDP. In a matched case-control Ethiopian study, Kahsay et al.[16] identified the risk of HDP to be 5.4 times higher in diabetic mothers. The relationship between HDP and diabetes is complex, as non-diabetic women who develop PE have also been observed to have a higher risk of developing type 2 diabetes in later life. Pathophysiological changes in microvasculature may be paramount elements underlying the link between these entities17.

Obesity has long been identified as another factor associated with HDP, as we corroborated in our cohort. Higher BMI values prior to pregnancy have been linked to greater rates of HELLP syndrome, ranging from 1.9 and 2.5 per 1000 women in the underweight and normal weight categories, to 3.2 and 4.0 in the overweight and obese categories. Obesity may also be related to onset of this condition before 34 weeks of gestation[18]. Interestingly, obese women have been demonstrated to display elevated circulating biomarkers of chronic activation of the innate immune system−including expression of CD11b, CD26L, and CD66b on polymorphonuclear neutrophils, among others−highlighting the key role of inflammation plays in this link[19].

Multiparity was also an important factor associated with PE and HELLP syndrome in our sample. Increasing parity has been linked with greater risk of developing HDP; especially in subsequent pregnancies with primipaternity[20]. Likewise, multiparity has been linked to poor prognosis in mothers with PE[21]. These epidemiological data may guide the direction of research in the future, in particular in territories with less available information in this regard, such as Ecuador.

Conclusions

In this retrospective study, we found HELLP syndrome is a significant public health problem in the Guaranda locality in Ecuador, as reflected in the patients who attended the ANMH between January and December 2022. AMA, history of HDP in previous pregnancies, diabetes, obesity and multiparity were ascertained as important predisposing risk factors for HELLP syndrome in our sample. This report offers a valuable epidemiological outlook on HELLP syndrome and PE for our community, and outlines directions for further research in this underserved area of our country, and similar areas in Latin America.

Our recommendations centrally feature prevention at all levels. Improved access to quality prenatal care is essential for appropriate management of the predisposing factors. Similarly, increased awareness of HELLP syndrome among rural physicians would facilitate early diagnosis and improve clinical management. Moreover, it is important, to strengthen actions focused on the recovery of patients who have clinically manifested the disease, ensuring proper diagnosis and treatment. Additionally, physical, psychological, and social rehabilitation should be considered for this population of patients, given the large impact these disorders may have in their lives. Implementing or improving data collection for monitoring and following up with patients at risk of or already experiencing HDP may also be highly valuable. Lastly, we believe it is key to address the social determinants that predispose certain groups to complications like HELLP syndrome in particularly vulnerable populations, such as the Guaranda locality in Ecuador.

References

1. Poon LC, Sahota D. Screening and Prevention of Preeclampsia. Maternal-Fetal Medicine. 2019 Jul;1(1):25.
2. Trottmann F, Baumann M, Amylidi-Mohr S, Surbek D, Risch L, Mosimann B, et al. Angiogenic profiling in HELLP syndrome cases with or without hypertension and proteinuria. Eur J Obstet Gynecol Reprod Biol. 2019 Dec;243:93–6.
3. Isler CM, Rinehart BK, Terrone DA, Martin RW, Magann EF, Martin JN. Maternal mortality associated with HELLP (hemolysis, elevated liver enzymes, and low platelets) syndrome. American Journal of Obstetrics and Gynecology. 1999 Oct 1;181(4):924–8.
4. Dusse LM, Alpoim PN, Silva JT, Rios DRA, Brandão AH, Cabral ACV. Revisiting HELLP syndrome. Clin Chim Acta. 2015 Dec 7;451(Pt B):117–20.
5. Jayawardena L, Mcnamara E. Diagnosis and management of pregnancies complicated by haemolysis, elevated liver enzymes and low platelets syndrome in the tertiary setting. Intern Med J. 2020 Mar;50(3):342–9.
6. Bracamonte-Peniche J, López-Bolio V, Mendicuti-Carrillo M, Ponce-Puerto JM, Sanabrais-López MJ, Méndez-Domínguez N, et al. Características clínicas y fisiológicas del síndrome de Hellp. Revista biomédica. 2018;29(2):33–41.
7. Ministerio de Salud Pública del Ecuador. Trastornos Hipertensivos del Embarazo. Guía de práctica clínica. (Hypertensive Disorders of Pregnancy. Clinical practice guideline). Quito: Ministerio de Salud Pública. Dirección Nacional de Normatización; 2018.
8. Olié V, Moutengou E, Grave C, Deneux-Tharaux C, Regnault N, Kretz S, et al. Prevalence of hypertensive disorders during pregnancy in France (2010-2018): The Nationwide CONCEPTION Study. The Journal of Clinical Hypertension. 2021;23(7):1344–53.
9. Abdullahi FM, Tornes YF, Migisha R, Kalyebara PK, Tibaijuka L, Ngonzi J, et al. HELLP syndrome and associated factors among pregnant women with preeclampsia/eclampsia at a referral hospital in southwestern Uganda: a cross-sectional study. BMC Pregnancy Childbirth. 2024 Oct 1;24:626.
10. Ngwenya S. Severe preeclampsia and eclampsia: incidence, complications, and perinatal outcomes at a low-resource setting, Mpilo Central Hospital, Bulawayo, Zimbabwe. IJWH. 2017 May 17;9:353–7.
11. Arriaga-García P, Montes-Martínez V, Arriaga-García P, Montes-Martínez V. Prevalencia de las categorías de hipertensión inducida por el embarazo que preceden a eclampsia. Ginecología y obstetricia de México. 2021;89(5):364–72.
12. Smithson SD, Greene NH, Esakoff TF. Pregnancy outcomes in very advanced maternal age women. Am J Obstet Gynecol MFM. 2022 Jan;4(1):100491.
13. Maeda N, Koyama M, Takatsuka S, Oyatani K, Himuro N, Mariya T, et al. Maternal age and the rising incidence of hypertensive disorders of pregnancy: A comprehensive analysis of national claims data from Japan. PLoS One. 2025;20(2):e0319177.
14. Juan Antonio, Gutiérrez Machado M, Cairo González V, Marín Tapanes Y, Rodríguez Róelo L, Veitía Muñoz M. Preeclampsia anterior como factor de riesgo en el embarazo actual. Revista Cubana de Obstetricia y Ginecología. 2014 Dec;40(4):368–77.
15. Malmström O, Morken NH. HELLP syndrome, risk factors in first and second pregnancy: a population-based cohort study. Acta Obstet Gynecol Scand. 2018 Jun;97(6):709–16.
16. Kahsay HB, Gashe FE, Ayele WM. Risk factors for hypertensive disorders of pregnancy among mothers in Tigray region, Ethiopia: matched case-control study. BMC Pregnancy Childbirth. 2018 Dec 6;18(1):482.
17. Weissgerber TL, Mudd LM. Preeclampsia and Diabetes. Curr Diab Rep. 2015 Mar;15(3):579.
18. Wang LQ, Bone JN, Muraca GM, Razaz N, Joseph KS, Lisonkova S. Prepregnancy body mass index and other risk factors for early-onset and late-onset haemolysis, elevated liver enzymes and low platelets (HELLP) syndrome: a population-based retrospective cohort study in British Columbia, Canada. BMJ Open. 2024 Mar 23;14(3):e079131.
19. Rimboeck J, Gruber M, Weigl M, Huber P, Lunz D, Petermichl W. Obesity Correlates with Chronic Inflammation of the Innate Immune System in Preeclampsia and HELLP Syndrome during Pregnancy. Biomedicines. 2023 Oct 20;11(10):2851.
20. Robillard PY, Iacobelli S, Lorrain S, Bonsante F, Boukerrou M, Scioscia M, et al. Primipaternity in multiparas as a predominant high risk factor for preeclampsia over prolonged birth intervals: A study of 33,000 singleton pregnancies in Reunion Island. PLOS ONE. 2024 Dec 23;19(12):e0312507.
21. Benfateh M, Cissoko S, Boufettal H, Feige JJ, Samouh N, Aboussaouira T, et al. Risk factors and poor prognostic factors of pre-eclampsia in Ibn Rochd University Hospital of Casablanca: about 401 preeclamptic cases. Pan Afr Med J. 2018 Dec 6;31:225.