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Epidemiology and maternal prognosis of hypertension disorders of pregnancy in French Guiana

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ABSTRACT

Background: Hypertensive disorders of pregnancy (HDP) are responsible for high maternal mortality and morbidity worldwide.

Objective: Our primary objective was to report the epidemiological and clinical features of HDP in Cayenne General Hospital. Our secondary objectives were to search for factors associated to preeclampsia (PE) and to severe PE in patients with HDP.

Methods: Our study was observational and non-interventional. It was conducted over 4-month period (January to April 2019) in the Obstetrics and Gynaecology Unit of the Cayenne General Hospital. We included all pregnant women after 20 weeks of gestation (WG), who gave birth and who presented HDP and/or PE.

Results: During the study period 1243 patients gave birth in our unit. Among them, 156 were diagnosed with HDP (12.6%). The median age was 33 years (IQR 28 – 38 years). The most frequent medical histories were diabetes (27.5%) and chronic hypertension (23.5%). The socioeconomic status was low in 31% of patients.

Ninety-four patients (61.4%) developed PE with a severe form in 80.9% of cases. HELLP syndrome was diagnosed in 6.5% and nephropathy in 3.3% of cases. Delivery was by cesarean in 49.7% of cases. The median gestational age at delivery was 37 WG (IQR: 35–39).

Multivariate analysis showed no independent factors associated with the occurrence of PE or severe PE in patients with HDP.

Conclusion: Our study shows a high prevalence of PE in patients with HDP. Hospitalization and repeated clinical evaluation are needed to screen for women exposed to develop PE or severe PE.

1. Introduction

Hypertension During Pregnancy (HDP) can be responsible of an increased risk of maternal and neonatal morbidity. The greatest risks are associated with a diagnosis of PE [1,2]. PE complicates 2%-8% of all pregnancies, and around 25% [3,4] of pregnant women with gestational or chronic hypertension. It contributes to 15% of preterm deliveries, and up to 26% of maternal deaths worldwide [5]. It is also a risk factor of cardiovascular disease throughout life [6–9].

Our primary objective was to report the epidemiological and clinical features of HDP in Cayenne General Hospital (French Guiana). Our secondary objectives were to search for factors associated to PE and to severe PE in patients with HDP.

2. Materials and methods

2.1. Setting and patients

Our study is observational non-interventional work. It was conducted over 4-month period (January 2019 to April 2019) in the Obstetrics and Gynecology Unit of the Cayenne General Hospital (French-Guiana). Cayenne is the capital of French Guiana. Our hospital is a 510-bed general center that serves as first-line medical center for an urban population of 150,000 inhabitants and as a referral center for a larger population coming from all French Guiana. Our unit is a level III one performing 4300 deliveries per year. The team is composed of 12 doctors, 65 midwives, and 17 nurses.

Abbreviations: HDP, Hypertension During Pregnancy; PE, Pre-eclampsia; DIC, disseminated intravascular coagulation; CMU, Universal Medical Coverage; AME, State Medical Aid; SBP, Systolic Blood Pressure; DBP, Diastolic Blood Pressure; WG, Weeks of gestation

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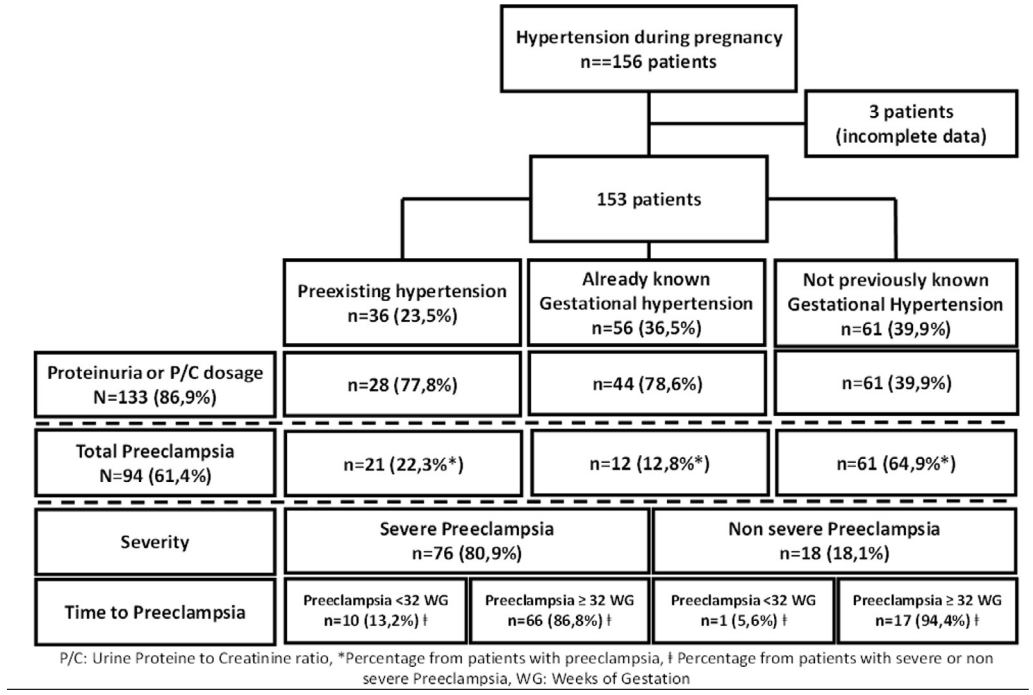

Fig. 1. Flow chart showing the distribution of our patients according to the occurrence of pre-eclampsia and to severe pre-eclampsia.

Table 1
Medical histories recorded in our patients.

Medicalhistory	Nb	nb(%)/Med(IQR)
Chronic Hypertension	153	36 (23.5%)
Gestational hypertension	153	26 (17%)
Pre-eclampsia	153	30 (19.6%)
Eclampsia	153	1 (0.7)
Placental abruption	153	3 (2%)
Intrauterin foetal death	153	9 (5.9%)
Diabetes	153	42 (27.5%)
Gestational diabetes	42	33 (78.6%)
Type 2 diabetes	42	9 (21.4%)
Sickle cell disease	153	20 (13.1%)
Haemoglobin gene	20	
AS		14 (70%)
AC		5 (25%)
CC		1 (5%)
Deep venous thrombosis	153	3 (2%)
Autoimmune disorder	153	2 (1.3%)
Gestation number	153	3 (2–5)
Parity number	153	2 (0–3)
Scarred uterus	153	31 (20.2%)
Myoma	153	11 (16.2%)
Anemia	153	10 (6.5%)
Asthma	153	7 (4.6%)
Social protection	150	131 (87.3%)

2.2. Inclusion criteria

We included in our study all pregnant women after 20 weeks of gestation (WG), hospitalized in our unit, who gave birth during the study period and who presented HDP and/or PE.

2.3. Definitions

The definition of HDP is based only on office blood pressure (BP) values: systolic BP (SBP) ≥ 140 mmHg and/or diastolic BP (DBP) ≥ 90 mmHg [10–12] and distinguishes mildly (140–159/90–109 mmHg) or severely (≥160/110 mmHg) elevated BP [13].

HDP comprises pre-existing hypertension, gestational hypertension, and PE [14]. Maternal complications are defined as renal injury [15], HELLP syndrome [5,16], acute fatty liver of pregnancy [16], pulmonary edema, eclampsia [17], disseminated intravascular coagulation (DIC), and delivery haemorrhage.

Table 2
The distribution of our patients according to the presence of pre-eclampsia or chronic hypertension.

History of chronic hypertension		Total patients
Yes	No	n = 153
n = 36	n = 117	
Chronic Hypertension	Gestational Hypertension	Total Hypertension without pre-eclampsia
n = 7	n = 32	n = 39
Superimposed Pre-eclampsia	Pre-eclampsia	Total Pre-eclampsia
n = 21	n = 73	n = 94
Chronic Hypertension without available Proteinuria	Gestational Hypertension without available Proteinuria	Not available Proteinuria
n = 8	n = 12	n = 20

Severe Features of PE are defined by any of these findings [18]: (1) Systolic blood pressure ≥ 160 mmHg, or diastolic blood pressure ≥ 110 mmHg on two occasions at least 4 h apart while the patient is on bed rest (unless antihypertensive therapy is initiated before this time); (2) Thrombocytopenia (platelet count < 100,000/microliter); (3) Abnormally elevated blood concentrations of liver enzymes (to twice normal concentration); (4) Severe persistent right upper quadrant and/or epigastric pain unresponsive to medication and not accounted for by alternative diagnoses; (5) Progressive renal insufficiency (serum creatinine concentration greater than 132 μmol/L without previous renal disease); or doubling of the serum creatinine concentration in the absence of other renal disease; or need for dialysis (without previous chronic renal failure) [15]; (6) Pulmonary edema; (7) New-onset cerebral or visual disturbances.

Early PE is defined as PE occurring before 32 WG. The follow-up during pregnancy is defined by at least one routine consultation per month since the third month of gestation by a physician or a midwife. In our study we have divided the follow-up during pregnancy in three

Table 3
Clinical and biological data recorded at admission.

Variable	Nb	nb(%)/Med(IQR)
Body Mass Index	136	29 (25–34)
Systolic arterial pressure, mmHg	153	157 (147–172)
Diastolic arterial pressure, mmHg	153	96 (89–101)
Head ache	153	55 (35.9%)
Akufen	153	9 (5.9%)
Abdominal pain	153	19 (12.4%)
Vision disorder	153	18 (11.8%)
Hyperreflexia	153	3 (2%)
Seizures	153	6 (3.9%)
Edema	152	75 (49.3%)
Pulmonary edema	153	1 (0.7%)
Proteinuria, g/L (on urine sample)	119	0.41 (0.14–1.3)
Urine creatinine, mmol/L	105	8 (4.5–14.5)
Spot urine proteine/creatinine ratio	105	45 (25–166)
Proteinuria, g/24-hour	97	0.54 (0.28–2.5)
Dueresis, ml/24 h	92	2000 (1500–2500)
Urea nitrogen, mmol/L	143	2.6 (1.9–3.7)
Uric acid, µmol/L	141	306 (257–363)
Blood creatinine, µmol/L	146	55 (48.3–65)
ASAT, UI/L	146	17 (13–22)
ALAT, UI/L	146	11 (8–19)
Platelet count, Giga/L	153	232 (187–286)
Hemoglobin, g/dL	153	11 (10.3–11.8)
Haptoglobin, g/L	101	1 (1–1)
Non dosable haptoglobin	116	15 (12.9%)

classes: (1) Complete follow-up: are those patients who had at least 80% of the required consultations during pregnancy; (2) Incomplete follow-up: are those patients who had between 50 and 79% of the required consultations during pregnancy; (3) Poor follow-up: are those patients who had between 50% of the required consultations during pregnancy; (4) No follow-up: are those patients who had no consultation during pregnancy. Obese status is defined by a Body Mass Index (BMI) greater than or equal to 30 kg/m^2. Socioeconomic status is defined according to four indicators: educational level, occupation, income and housing. The educational level is the highest level of education up to which the patient has arrived. Was considered as a low level of education a woman having completed her education until primary school or secondary school (between 8 and 12 years of study), and as a high level of study women who did graduate school after the bachelor's degree and corresponding to more than 12 years of study. For the profession we determined whether the patient was unemployed or had a professional activity. The incomes were defined from the social security status. To benefit from Universal Medical Coverage (CMU) or State Medical Aid (AME) patient must receive less than 734 euros per month which is a factor of disadvantage, the poverty line in France is either 855euros / month or 1026 euros / month according to the definition of poverty used (respectively at 50% threshold and 60% of the median standard of living) (INSEE, 2016 data, available at https://www.insee.fr/). Patients with AME or CMU were therefore considered living below the poverty line, and patients with social security were considered living above the poverty line. The housing was divided into two groups: Not precarious (house, apartment) and precarious housing (wooden houses, squat …). A woman was considered (1) having a low socioeconomic status in case of less than one of these four criteria, (2) having a middle socio-economic level a woman with 2 of these criteria, and (3) having a high socio-economic level those with more than 3 criteria. Preterm birth is defined by birth before 37 completed weeks of amenorrhea.

2.4. Data collection

Data of all patients were collected and, a detailed clinical profile of each patient was established.

Our database has been registered at the "Commission Nationale de l'Informatique et des Libertés" (registration number 2,214,306 v 0), in compliance with French law on electronic data sources.

2.5. Statistical analysis

Results are reported as median and interquartile range (IQR: 25th–75th percentiles), or numbers with percentages (Nb(%)).

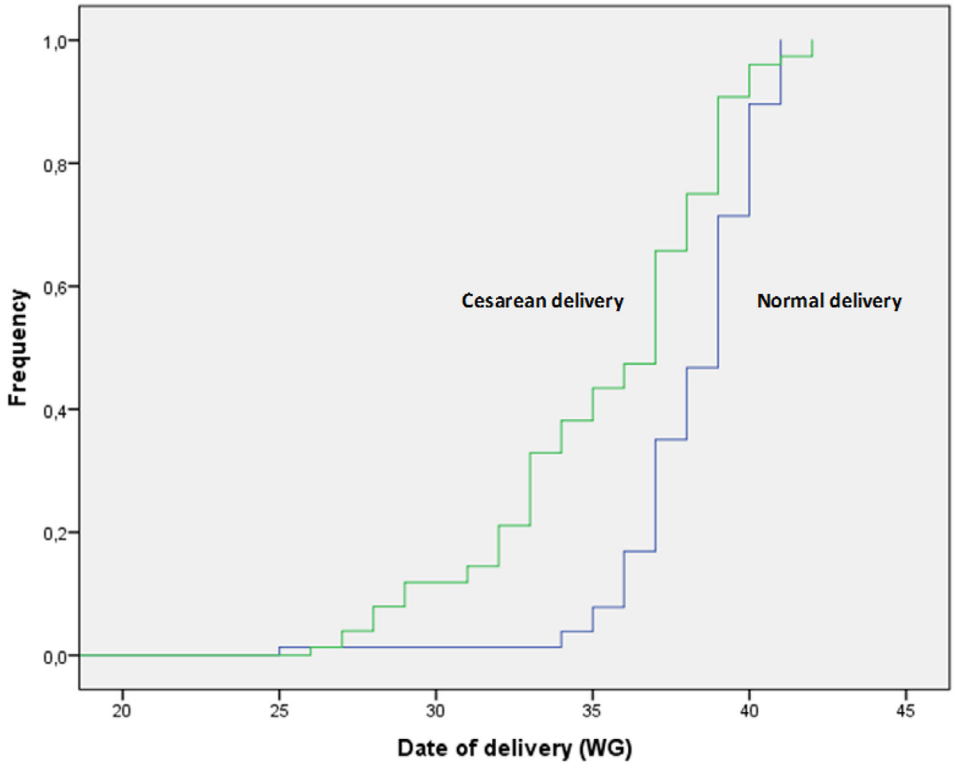

Fig. 2. The frequency and type of delivery according to the gestational age (Weeks of Gestation).

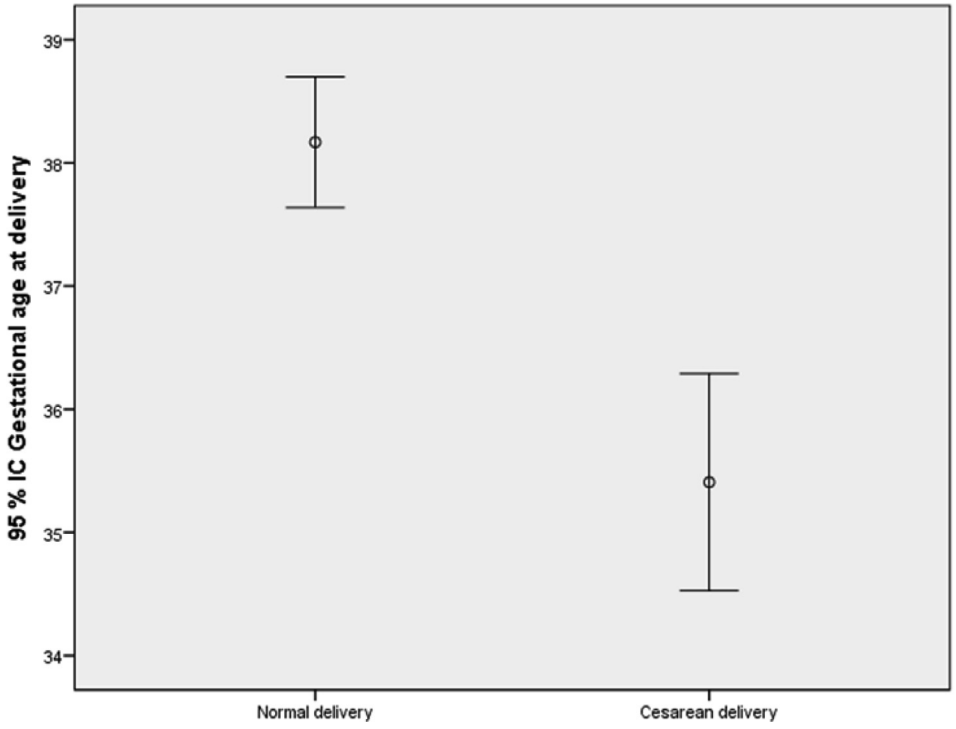

Fig. 3. The gestational age at delivery (Weeks of gestation) according to the type of delivery ($p < 0.001$).

Table 4
Maternal variables associated to the occurrence of pre-eclampsia in our patients.

Variable	Pre-eclampsia Nb	Nb (%)/Med(IQR)	No Pre-eclampsia Nb	Nb (%)/Med(IQR)	p
Age < 20 years	94	9 (9.6%)	39	0	0.045
Gestational age at admission, WG	93	36 (32–38)	39	38 (36–39)	0.001
Systolic arterial pressure, mmHg	94	162 (150–175)	39	151 (145–160)	0.001
Diastolic arterial pressure, mmHg	94	99 (90–104)	39	94 (87–100)	0.007
Headache	94	43 (45.7%)	39	9 (23.1%)	0.015
Edema	93	57 (61.3%)	39	13 (33.3%)	0.003
Proteinuria, g/L	85	0.67 (0.3–2.03)	34	0.14 (0.08–0.23)	0.004
Urine proteine-creatinine ratio, mg/µmol	75	81 (41–226)	30	19 (13–24)	0.011
Proteinuria in the 24-hour collection, mg	76	1.10 (0.41–3.01)	21	0.17 (0.14–0.18)	0.005
HELLP syndrome	94	10 (10.6%)	39	0 (0%)	0.034
Maternal complications	94	30 (31.9%)	39	5 (12.8%)	0.023
Gestational age at delivery, WG	94	37 (33–39)	39	39 (37–39)	0.002
Preterm birth	94	38 (40.4%)	39	8 (20.5%)	0.028
Medical follow-up	94	80 (85.1%)	39	20 (51.3%)	0.000

Initial bivariate statistical comparisons were conducted using the Chi-square or Fisher's exact test for categorical data and the Independent-Samples T test for continuous data. To identify patients' characteristics associated with PE, and severe PE we used multivariable logistic regression with a backward procedure. Non-redundant variables selected by bivariate analysis ($p < 0.05$) and considered clinically relevant were entered into a logistic regression model. A p value < 0.05 was considered statistically significant.

All statistical analyses were carried out with Excel 2007 and SPSS program version 24.

3. Results

During the study period 1243 patients gave birth in our unit. Among them, 156 were diagnosed with HDP (12.6%). Three cases were excluded from our study because of incomplete data. Then, the total number of studied cases was 153. Among them, 94 (61.4%) had PE and 76 (80.9% of patients with PE) had severe PE (Fig. 1).

Eighty-three patients (52.4%) where South-American, 69 (45.1%) were from the Caribbean zone and one patient was African.

The median age of our patients was 33 years (IQR 28 – 38). Ten patients (6.5%) were less than 20 years old. Eighty-five patients (55.6%) had at least one medical history. The most frequent medical histories were diabetes (27.5%) and chronic hypertension (23.5%) (Table1). The distribution of our patients according to the presence of PE and chronic hypertension is reported in Table 2. The diabetes was gestational in 78.6% of cases and type-2 diabetes in 21.4% of cases. The socioeconomic status was monitored in 86 patients (56.2%). It was low in 47 patients (55.3%).

The gestational age at admission was recorded in 152 patients. It was 37 WG (IQR: 34–39). One patient was hospitalized at day 8 postpartum. Age was higher in patients with chronic hypertension [36 (IQR: 33–39) vs 32 (IQR: 25–36); p < 0.001].

The comparison of clinical data according to the presence of a medical history of hypertension showed no difference between subgroups except for BMI which was higher in patients with medical history of hypertension [30 (IQR: 27.7–37.5) vs 29 (23–34); p = 0.001].

Clinical and biological data in general population are reported in

Table 5
Variables associated to severe pre-eclampsia in our patients.

Variable	Severe-pre-eclampsia Nb	Nb (%)/Med (IQR)	Non severe pre-eclampsia Nb	Nb (%)/Med (IQR)	p
Age, years	76	34 (28–37)	18	30 (23–33)	0.030
Age < 20 years	76	5 (6.6%)	18	4 (22.2%)	0.043
Gestation number	76	4 (2–5)	18	2 (1–3)	0.025
Parity number	76	2 (1–4)	18	1 (0–2)	0.030
Follow-up by a midwife	76	48 (63.2%)	18	16 (88.9%)	0.035
Systolic arterial pressure, mmHg	76	167 (157–178)	18	148 (143–152)	0.000
Head ache	76	43 (56.6%)	18	0 (0%)	0.000
Abdominal pain	76	15 (19.7%)	18	0 (0%)	0.040
Urine creatinine, mmol/L	62	7.3 (4.1–12.5)	13	12.6 (8.4–17.5)	0.046
Platelet count, Giga/L	76	226 (166–269)	18	284 (215–326)	0.009
Complications	76	50 (65.8%)	18	5 (27.8%)	0.003
Maternal complications	76	30 (39.5%)	18	0 (0%)	0.001
Normal delivery	76	29 (38.2%)	18	14 (77.8%)	0.002
Cesarean delivery	76	47 (61.8%)	18	4 (22.2%)	0.002
Antihypertensive drug	76	70 (92.1%)	18	12 (66.7%)	0.004
Length of antihypertensive drug administration	45	2 (2–3)	6	2 (2–2)	0.025

Table 3.

Proteinuria (g/L) dosage was available in 119 patients (77.8%). Il was ≥ 0.3 g/L in 71 cases (59.6%). Spot urine protein to creatinine ratio was available in 105 patients (68.7%). It was ≥ 30 mg/mmol in 69 cases (65.7%). Biological renal function was monitored in 146 cases (95.4%). It showed renal impairment in 14 cases (9.6%). Liver enzymes dosage was performed in 146 cases (95.4%). They were elevated in 10 cases (6.8%). Platelet count was available in all patients. It was below 150 G/L in 20 cases (13.1%). Haptoglobin dosage was available in 116 cases (75.8%). It was too low in 15 cases (12.9%).

In patients with PE, maternal complications were found in 40 cases (42.6%) and fœtal complications in 71 cases (75.5%). Eclampsia was recorded in 6 patients and HELLP syndrome in 10 patients. The association Eclampsia and HELLP syndrome was observed in one patient. Then, 9 patients with HELLP syndrome did not developed eclampsia and 5 patients with eclampsia did not developed HELLP syndrome. Four patients with eclampsia were hospitalized in ICU and received multiparametric monitoring (hemodynamic, respiratory, renal, liver, neurologic and hematologic monitoring). All patients recovered well and none of them presented recurrent seizures.

Delivery was normal in 77 cases (50.3%) and by cesarean in 76 cases (49.7%). Cesarean was emergent in 50 cases (65.8%) and scheduled in 26 cases (34.2%). Gestational age at delivery was 37 WG (IQR: 35–39). Fig. 2 shows the frequency and type of delivery according to the gestational age. Fig. 3 shows the gestational age at delivery according to the type of delivery ($p < 0.001$).

Associated factors to PE and to severe PE

In univariable analysis, maternal factors associated with the occurrence of PE or to severe PE are reported in Tables 4 and 5 respectively. Multivariable analysis did not find any independent factor associated to the occurrence of PE or severe PE.

4. Discussion

The incidence of the HDP varies between 1.8% and 9.2% [17,19,20]. In our center, the rate of HDP was 12.6% of patients who gave birth during the study period. This rate is higher than the one reported in the literature probably because of the high rate of chronic hypertension in our population (23.5%).

PE complicates 2%–8% of all pregnancies, and around 25% [3,4] of pregnant women with gestational or chronic hypertension. In our study, PE was diagnosed in 61.4% of patients with HDP and 7.5% of patients who gave birth during the study period. It was severe in 80.9% of cases and was responsible of a high rate of cesarean delivery and preterm birth. Multivariable analysis did not find any independent factor which can predict the occurrence of PE or severe PE. For this reason, we believe that women with HDP and PE or organ dysfunction should be hospitalized and closely monitored to detect the occurrence of complication.

The diagnosis of PE is based on the presence of HDP with significant proteinuria [14]. Proteinuria is best measured using a 24-hour urine collection [21]. In our study, 24-hour collection proteinuria levels were not associated to a greater risk of severe PE in the general population and in the subgroups with and without history of chronic hypertension. Indeed, in patients with history of chronic hypertension, a preexisting glomerular injury can cause protein leakage in the urines independently of PE. For this, we analyzed patients with and without chronic hypertension separately to avoid this potential confounder factor.

The results of our study may be useful to increase awareness regarding the ongoing risks and effects of Hypertensive disorders of pregnancy (HDP) which may be responsible for high maternal mortality and morbidity in South America and also in the Caribbean. Maternal age, primiparous, multiple pregnancy, HDP in previous pregnancy, gestational diabetes mellitus, preexisting hypertension, preexisting type 2 diabetes mellitus, preexisting urinary tract infection and a family history of hypertension, type 2 diabetes mellitus and preeclampsia are common risk factors that should be researched to screen patients at risk of PE.

In conclusion, the rates of HDP and PE are high in FG factors to predict PE and severe PE remains unclear. Future cohort studies are needed to provide robust evidence concerning the association clinical and biological alterations with maternal outcomes.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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