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Original Research Article

Determinants of occurrence of chronic hypertension in patients who had preeclampsia at the Yaoundé central hospital

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ABSTRACT

Background: Preeclampsia is an abnormal elevation of blood pressure with systolic blood pressure ≥140 mmHg, and/or diastolic blood pressure ≥90 mmHg associated with proteinuria in a pregnant woman beyond 20 weeks of gestation. This generally disappears postpartum. Some women, however, will later on develop chronic hypertension. Our objective was to assess the determinants of occurrence of chronic hypertension in patients who had preeclampsia at the Yaoundé Central Hospital.
Methods: we carried out a retrospective case-control study over ten years from January 2012 to December 2022. The cases consisted of women who developed chronic hypertension within 5 years following an episode of preeclampsia in pregnancy. These were matched with two controls each; women who had not developed chronic hypertension following preeclampsia in pregnancy.
Results: We recruited 60 cases and 120 controls. After bivariate analysis, the sociodemographic factors seemingly associated with the occurrence of chronic hypertension were; age between 25-35 years p=0.01; OR=2.9 (1.5-5.5), the profession of pupil/student; p=0.05; OR=0.3 (0.12-0.7). The clinical factors found were multigravidas; OR=3.1 (1.6-5.9); p=0.00, as well as pauciparous women; OR=2.1 (1.1-4.4); p=0.03, family history of hypertension; OR=2.5 (1.3-4.8); p=0.04 and BMI greater than 40 kg/m2; OR=3.8 (1.0-13.6); p=0.02. After logistic regression, the factor independently associated with the occurrence of chronic hypertension is a family history of hypertension; p=0.01; OR=2.45 (1.18-4.96).
Conclusions: A family history of hypertension is a major risk factor for the occurrence of chronic hypertension in patients who have had preeclampsia.

Keywords: Chronic hypertension, Determinants, Preeclampsia

INTRODUCTION

Arterial hypertension is an abnormal elevation of blood pressure with systolic blood pressure (SBP) ≥140 mmHg and/or diastolic blood pressure (DBP) ≥90 mmHg in adults ≥18 years of age under normal measurement conditions.[1] In addition, the American College of Obstetricians and Gynecologists (ACOG) distinguishes between chronic and pregnancy-induced hypertension.[2] Thus, preeclampsia is hypertension which occurs after 20 weeks of gestation with a SBP increased by 30 mmHg and a DBP increased

by 15 mmHg; in a woman whose blood pressure was previously normal with the appearance of newly unexplained proteinuria (≥300 mg/24 hours).[3-6]

In Cameroon, we have a prevalence of 29.7% of hypertensive patients.[1] In a study by Mboudou et al at the Gyneco-Obstetric and Pediatric Hospital Yaoundé in 2009, hypertension occurs preferentially in primiparous women between 20 and 30 years of age.[7] Hypertension during pregnancy usually disappears within a few weeks after delivery. However, approximately 17% of patients remain hypertensive 3 months later with an enormous risk of developing other cardiovascular, renal, etc. lesions.[4] Therefore, the prognosis of these women is not only based on antihypertensive treatment, but rather on the quality of multidisciplinary care.[4] The risk factors for chronic hypertension linked to preeclampsia are not clearly identified and elaborated in Cameroon, thus the necessity of our study on the determinants of the occurrence of chronic hypertension in patients who have had preeclampsia.[5-41] The general objective was to assess the determinants of occurrence of chronic hypertension in patients who had preeclampsia at HCY.

METHODS

This study was a retrospective case-control study, carried out at the maternity ward and cardiology department of the Yaoundé Central Hospital (HCY). Our study period was 9 months, running from November 2022 to July 2023. Data collection spanned through a 10-year period from January 1, 2012 to December 31, 2022. The selection criteria for our study were all patients who had been diagnosed with preeclampsia at the maternity ward of HCY between 2012 and 2017.

We included into the group of cases, medical records of patients who had developed chronic hypertension within 5 years following preeclampsia. Group of Controls: medical records of patients who did not develop chronic hypertension within 5 years following preeclampsia. Patients with other comorbidities such as Diabetes diagnosed after delivery were not included in our study. We excluded patients who didn't give consent for the study, patients with incomplete medical records, and those with unavailable contacts. Following obtainment of ethical approval from the Institutional Ethics Committee for Research on Human Health, University of Douala, Cameroon, and administrative approval from the director of HCY, we proceeded with data collection. Recruitment was initiated at the maternity ward by making telephone calls to all women who had been diagnosed with preeclampsia between 2012 and 2017 to identify those who had or had not developed chronic hypertension 5 years later. Patients who had developed hypertension confirmed by a cardiologist in HCY were recruited at the cardiology unit. We then proceeded with the filling of questionnaires. Data was collected and analysed with SPSS version 25.0.

RESULTS

Sociodemographic characteristics associated with the occurrence of chronic hypertension

The average age of the case group was 29±5.67 years, with extremes of 15 and 41 years; the average age of the control group was 26 years ±6.83 with the extremes 15 years and 41 years. The (Table 1) presents the distribution by age, profession, level of education, marital status and place of residence. The sociodemographic factors that were seemingly associated with the occurrence of chronic hypertension in women with preeclampsia were: age; 25-35; p=0.01; OR=2.9 (1.5-5 .5), pupil/student (p=0.05; OR=0.3; 0.12-0.7).

Clinical factors at the time of diagnosis of chronic hypertension

The mean time to onset of postpartum preeclampsia was 4.18±3.8 days in the case group and 1.38±0.58 days for the controls; the extremes were D0 and D10 for the cases; D0 and D5 for controls. The (Table 2) presents the clinical factors associated with the occurrence of chronic hypertension in women with Preeclampsia. The primigravida; OR=0.2 (0.1-0.5); p=0.00 and nulliparous, p=0.00; OR=0.3 (0.1-0.7) factors appeared as protective factors.

The multigravida had 3.1 times more risk of developing chronic hypertension; OR=3.1 (1.6-5.9); p=0.00, as well as the pauciparous who had 2.1 times more risk of developing chronic hypertension following preeclampsia (OR=2.1; 1.1-4.4); p=0.03. The (Table 3) represents the average gestational age and time to onset of preeclampsia in the two populations.

In the case population, PE occurred significantly earlier than in the control population. For those with postpartum PE, the mean time to onset was significantly higher in the case group (4.18±3.8; p=0.01) compared to that of the controls. The (Table 4) presents the grades of hypertension according to the WHO during the diagnosis of PE. In this study, 55% of the cases had grade III hypertension and 48.3% of the controls. The (Table 5) shows the distribution according to comorbidities. Waist circumference and BMI were taken after delivery. The latter was observed in 88% of cases and 79.0% of controls. About 90% of women in both groups had a BMI greater than 25 kg/m2. In our study, 50% of cases and 28.3% of controls had a family history of hypertension. In the case group, 26.7% had a BMI between 30 and 34 kg/m2. Among the controls, 35% had a BMI between 25 and 29 kg/m2. The WC was mostly elevated in the case group at 77.5% (p=0.63; OR=1.6; 0.6-2.1). A family history of HTN multiplied the risk of occurrence of chronic hypertension by 2.5 (p=0.04; OR=2.5) and women with a BMI greater than 40 kg/m2 had 3. 8 times (p=0.02; OR=3.8) greater risk of chronic hypertension.

Table 1: Distribution by age, profession, level of education, marital status and place of residence (n=180).

Variables	Case, N (%)	Control, N (%)	Total, N	P value	OR (CI=95%)
Age (years)					
15-25	12 (20.0)	58 (48.3)	70	0.00	0.2 (0.1-0.6)
25-35	39 (65.0)	47 (39.2)	86	0.01	2.9 (1.5- 5.5)
35-45	9 (15.0)	15 (12.5)	24	0.64	1.2 (0.5 - 3.0)
Occupation					
Private sector	6 (10.2)	13 (10.9)	19	0.8	0.9 (0.3-2.5)
Civil servant	13 (21.7)	17 (14.2)	30	0.21	1.6 (0.7-3.7)
pupil/student	7 (11.7)	37 (30.8)	44	0.05	0.3 (0.12-0.7)
Housewife	4 (6.7)	9 (7.5)	13	0.88	0.8 (0.2-2.9)
Personal account	14 (23.3)	25 (20.8)	39	0.74	1.1 (0.5-2.4)
Unemployed	15 (25.0)	18 (15.0)	33	0.11	1.8 (0.8-4.0)
Level of education					
Primary	3 (5.6)	13 (11.7)	16	0.22	0.4 (0.1-1.6)
Secondary	35 (64.8)	61 (55.0)	96	0.25	1.5 (0.7-2.9)
Higher	15 (27.8)	36 (32.4)	51	0.54	0.8 (0.3-1.63)
None	1 (1.9)	1 (0.9)	2	0.60	2.0 (0.1-33.8)
Marital status					
Married	22 (36.7)	34 (28.3)	56	0.26	1.4 (0.7-2.8)
Single	34 (56.7)	82 (68.3)	116	0.12	0.6 (0.3-1.1)
Widow	1 (1.7)	0	1	0.15	
Place of residence					
Urban	57 (95.0)	119 (99.2)	176	0.07	0.1 (0.0-1.5)
Rural	3 (5.0)	1 (0.8)	4		

Table 2: Distribution according to obstetrical parameters (n=180).

Variables	Case, N (%)	Control, N (%)	Total, N	P value	OR (CI=95%)
Period of diagnosis of hypertension in pregnancy					
Before childbirth	47 (81.0)	104 (86.7)	151	0.32	0.6 (0.2-1.5)
After childbirth	11 (19.0)	16 (13.3)	27	0.32	1.5 (0.6-3.5)
GA in weeks at onset of hypertension in pregnancy					
<28	8 (13.3)	7 (5.8)	15	0.08	2.4 (0.8-7.2)
28-37	12 (20.0)	25 (20.8)	37	0.89	0.9 (0.4-2.0)
37-42	28 (46.7)	70 (58.3)	98	0.14	0.6 (0.3-1.1)
>42	0	1 (0.8)	1	0.48	
Gravidity					
Primigravida	11 (18.3)	54 (45.0)	65	0.00	0.2 (0.1-0.5)
Paucigravida	11 (18.3)	23 (19.2)	34	0.91	0.9 (0.4-1.8)
Multigravida	38 (63.3)	43 (35.8)	81	0.00	3.1 (1.6-5.9)
Parity					
Nulliparous	19 (31.7)	67 (55.8)	86	0.002	0.3 (0.1-0.7)
Primiparous	12 (20.0)	20 (16.7)	32	0.58	1.2 (0.5-2.7)
Pauciparous	19 (31.7)	21 (17.5)	40	0.03	2.1 (1.1-4.4)
Multiparous	10 (16.7)	12 (10.0)	22	0.20	1.8 (0.7-4.4)
Number of fetuses					
Singleton	56 (93.3)	112 (93.3)	168	1	1 (0.2-3.4)
Multiple	4 (6.7)	8 (6.7)	12	1	
Number of ANC contacts					
<8	46 (97.9)	102 (97.1)	148	0.40	0.7 (0.4-1.4)
≥8	1 (2.1)	3 (2.9.)	4	0.60	0.8 (0.4-1.5)

Table 3: Mean gestational age and time to onset of preeclampsia (n=180).

Parameters	Mean±SD		Difference of means (CI 95%)	P value
	Cases	Controls		
Mean GA at onset (weeks)	34±9.1	36.45±5.35	-2.46 (-4.8-0.12)	0.02
Time to onset in postpartum (days)	4.18±3.8	1.38±1.58	2.8(0.62-4.99)	0.01

Table 4: Grade of HTN at diagnoses (n=180).

Variables	Case, N (%)	Control, N (%)	Total, N	P value	OR (CI=95%)
Grade I	2 (3.3)	18 (15.0)	20	0.01	0.1 (0.04-0.9)
Grade II	24 (40.0)	39 (32.5)	63	0.32	1.4 (0.7-2.6)
Grade III	33 (55.0)	58 (48.3)	91	0.40	1.3 (0.7-2.4)

Table 5: Distribution according to comorbidities (n=180).

Variables	Case, N (%)	Control, N (%)	Total, N	P value	OR (CI=95%)
Diabetes	5 (31.3)	1 (6.6)	6	0.08	10.8 (1.2-94.8)
HIV	5 (31.3)	0	5		
Viral Hep B	0	1 (6.6)	1		
Asthma	1 (6.6)	2 (12.5)	3		
BMI					
Normal	4 (6.7)	11 (9.2)	16	0.56	0.7 (0.2-2.3)
Overweight	14 (23.3)	42 (35.0)	56	0.11	0.5 (02-1.1)
Grade 1 obesity	16 (26.7)	27 (22.5)	43	0.53	1.2 (0.6-2.5)
Grade 2 obesity	8 (13.3)	10 (8.3)	18	0.29	1.6 (0.6-4.5)
Grade 3 obesity	7 (11.7)	4 (3.3)	11	0.02	3.8 (1.0-13.6)
Waist circumference (WC)					
>88	31 (77.5)	61 (73.5)	92	0.63	1.6 (0.6-2.1)
≤88	9 (22.5)	22 (26.5)	31		
Past history					
Family history of HTN	30 (50)	34 (28.3)	64	0.04	2.5 (1.3-4.8)
Alcohol	1 (1.7)	3 (2.5)	4	0.7	0.6 (0.6-6.4)
Tobacco	1 (1.7)	0	1		-

Table 6: Signs of PE severity (n=180).

Variables	Case N (%)	Controls n(%)	Total	P value	OR (CI= 95%)
Elevated BP	51 (94.4)	90 (97.8)	141	0.28	0.3 (0.06-2.3)
Headaches	14 (25.9)	15 (16.3)	29	0.16	1.79 (0.78-4.08)
Blurred vision	3 (3.56)	6 (6.5)	9	0.81	0.84 (0.20-3.51)
Oliguria	0	1 (1.1)	1	0.44	-
IUGR	5 (9.3)	4 (4.3)	9	0.23	2.24 (0.57-8.75)
Epigastric pain	3 (5.6)	6 (6.5)	9	0.81	0.84 (0.20-3.51)
Thrombopenia	2 (3.7)	5 (5.4)	7	0.63	0.66 (0.12-3.57)
Convulsions	9 (16.7)	14 (15.2)	23	0.81	1.11 (0.44-2.78)
Vertigo	7 (13.0)	11 (12.1)	18	0.87	1.08 (0.39 - 2.98)
Altered hepatic function	0	2 (2.2)	2	0.27	-

Comparison of average BMI and waist circumference

The mean BMI was respectively for the cases 31.7±6.3 kg/m2 and 29.07±5.02 kg/m2 for the controls; while waist circumference averaged 94.2±9.4 cm for cases and 90.9±90.9 cm for controls. There was no significant difference in mean BMI (p=0.06) and waist circumference (p=0.7) in the two populations. The (Table 6) represents the signs of severity of preeclampsia. High blood pressure: ≥160/110 mmHg was the most frequent sign of severity in the 2 groups, i.e. 94.4% of cases and 97.8% of controls respectively. In our study, 70% and 95% of patients respectively in the case and control groups had a urea level below 0.45 g/l. 80% and 75% had a creatinine level below 11 mg/l respectively in the case and control groups. Regarding the coagulation profile, all the cases had a normal prothrombin level, against 91.7% of the controls.

Table 7: Logistic regression (n=180).

Variables	Case N (%)	Controls N (%)	OR (CI= 95%)	P value
Age (years)				
15-25	12 (20.0)	58 (48.3)	0.93 (0.24-3.5)	0.917
25-35	39 (65.0)	47 (39.2)	1.87 (0.67-5.22)	0.228
Profession				
Pupil/student	7 (11.7)	37 (30.8)	0.54 (0.17-1.67)	0.290
Gravidity				
Primigravida	11 (18.3)	11 (18.3)	0.96 (0.29-3.21)	0.95
Multigravida	54 (45.0)	54 (45.0)	2.09 (0.75-5.76)	0.15
Parity				.
Nulliparous	38 (63.3)	38 (63.3)	0.36 (0.19-0.7)	0.003
Pauciparous	43 (35.8)	43 (35.8)	1.11 (0.43-2.87)	0.82
Past history				
Family history of HTN	30 (50)	34 (28.3)	2.45 (1.18-4.96)	0.01

Total 68.8% of the women in the case group had a TCK of less than 35 seconds, as did 80% of the controls. The INR was less than 1 in 52.5% of cases and 66.7% of controls. The liver function test had shown ASAT greater than 25 IU/l in 60% of the cases and 62.5% of the controls. The ALAT level was below 30 IU/l in 70% of cases and 61.5% of controls had a level above 30 IU/l. Platelets were greater than 150,000/mm3 in 88.2% of cases and 66.7% of controls. 93.8% of the case group had a normal hemoglobin level as well as 92.3% of the controls. The (Table 7) shows factors associated with the occurrence of chronic hypertension following preeclampsia after logistic regression. After logistic regression, the factor independently associated with the occurrence of chronic hypertension was: family history of hypertension (p=0.01; OR=2.45: 1.18-4.96). Nulliparity was a protective factor; p=0.003; OR=0.36 (0.19-0.7).

DISCUSSION

We deduced that age between 25-35 years (p=0.01; OR=2.9; 1.5-5.5) seemed to be associated with the occurrence of chronic hypertension in women with preeclampsia. This result differs from that of Nganou-Gnindjio et al. in 2021 who found that an age of 37 years was linked to the persistence of chronic hypertension; in the same order Amougou et al. in 2019 who found an age ≥40 years.[42-43] This can be explained by the fact that hypertension increases with age. Furthermore, being a pupil/student (p value=0.05; OR=0.3:0.12-0.7) was the most common occupation. Result which differs from those of Amougou et al who reported in a retrospective cohort study that housewives were associated with a progression to chronic hypertension (OR=21.8:3.4-138.3); p=0.001).[43] This can be explained by the fact that the students are more active and therefore less sedentary, a young population and our study ran through period of 5 years compared to housewives exposed to a sedentary lifestyle which is a risk factor for cardiovascular disease.[12] We found that multigravidas had 3.1 times more risk of developing chronic hypertension (OR=3.1:1.6-5.9; p=0.00), as well as pauciparas who had 2.1 times greater risk of developing chronic hypertension following preeclampsia; OR=2.1 (1.1-4.4); p=0.03. Several authors like Martillotti et al in Switzerland, Amougou et al in Cameroon, Nganou-Gnindjio et al in Cameroon respectively found a very high relative risk in multiparas (RR=5.96; 3, 42-10.38), multiparous >4 (OR= 7.9:1.0-59.1; p=0.044) and ≥5 (OR=7.7:2.3; 21.6).[13,42,43] These results are all similar due to the fact that women who had PE during pregnancy are more at risk of having it during a subsequent pregnancy; this therefore constitutes a factor of exposure to long-term chronic hypertension.

Moreover, the family history of hypertension multiplied the risk of occurrence of chronic hypertension by 2.5 (OR=2.5: 1.3-4.8; p=0.04) and women with a BMI greater than 40 kg/m2 had a 3.8 times greater risk of chronic hypertension (OR=3.8: 1.0-13.6; p=0.02). Several authors like Florine Vampouille in France who reported that the predictive factors significantly associated with the occurrence of chronic hypertension were BMI, abdominal circumference, high parity; Jarawee et al in 2022 in Thailand who discovered a high risk of persistent hypertension after DHG (RR=5.34; 2.74-10.39); Amougou et al in 2019 in Yaoundé found hypertension in siblings (OR=6.7; 1.0-44.2; p=0.047) and obesity (OR=16.5; 2.3-120.6); p=0.006.[9,43,45] The similarity between these results emerges from the findings of the same factors: obesity being a factor independently linked to PE but a risk factor associated with the risk of developing chronic hypertension. In addition, Nganou-Gnidjio et al found that a family history of diabetes was associated with the persistence of hypertension following preeclampsia (OR= 5.2; 1.9-14.1).[42] This difference could be explained by the fact that the investigator did not look for a family history of diabetes during data collection.

Limitations

Our study was not without limitations; recruitment was based on medical records which was challenging as some

files were incomplete and electronic/digital records are not available. Some participants were unreachable due to incorrect telephone contacts, or contacts which had been attributed to others. There was also the issue of loss to follow-up and memory bias.

CONCLUSION

This study revealed that age between 25-35 years, multiparity, a high BMI and most especially a family history of hypertension were determinants of the occurrence of the chronic hypertension in patients who had preeclampsia. Women who have the aforementioned risk factors should be counseled with respect to life style modifications and strict adherence to cardiology follow up in the postpartum period and beyond.

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