Original Article

Risk Factors for Hypertensive Disorders in Pregnancy: A Report from the Maroua Regional Hospital, Cameroon

Pierre Marie Tebeu [1,2,3*], Pascal Foumane [1], Robinson Mbu [1], Gisèle Fosso [2], Paul Tjek Biyaga [3], Joseph Nelson Fomulu [3]

1- Department of Obstetrics and Gynaecology, University Hospitals, Yaoundé, Cameroon
2- Ligue d'Initiative et de Recherche Active pour la Santé et l'Education de la Femme (LIRASEF), Yaoundé, Cameroon
3- Department of Obstetrics and Gynaecology, Regional Hospital, Maroua, Cameroon

Abstract

Introduction: A recent study at the Maroua Provincial Hospital revealed that hypertension in pregnancy was the first cause of maternal death, representing 17.5% of the 63 maternal deaths recorded between 2003 and 2005. Knowing little about the causes, this study was to identify the possible risk factors for hypertensive disorders in pregnancy.

Methods: This case-control study was-done at the Maroua Regional Hospital, Cameroon between June 2005 and May 2007. All the 152 deliveries complicated with hypertension were compared and analyzed with 414 pregnancies that were not complicated with the disease. Data analysis was performed using EPI Info 3.5.1. The differences were considered to be significant if the p-values were less than 0.05.

Results: Using univariate analysis, several factors linked to hypertensive disorder in pregnancy were identified. They included early adolescence, nulliparity, illiteracy, lack of occupation and family history of hypertension. At multivariate analysis, the risk of having hypertension during pregnancy remained greater for illiterate women (OR: 1.6; 95%CI: 1.0-2.3), housewives (OR: 2.8; 95%CI: 1.1-6.9), nulliparae (OR: 2.8; 95%CI: 1.5-3.6), women with family histories of hypertension (OR: 3.6; 95%CI: 1.6-8.5) and women with histories of hypertension during pregnancy (OR: 7.0; 95%CI: 3.0-16.4).

Conclusion: Risk factors for hypertensive diseases in pregnancy in Maroua, Cameroon seem to include early teenage status, illiteracy, housewife status, nulliparity and family or personal histories of hypertension. The knowledge about the aforesaid factors seems to lay the tracks for its prevention in Cameroon.

* *Corresponding Author:*
Pierre Marie Tebeu,
Department of Obstetrics and Gynaecology,
University Teaching Hospital, Yaoundé,
Cameroon.
E-mail:
pmtebeu@yahoo.fr

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Introduction

Hypertensive disorder in pregnancy is a condition in which the pregnant woman presents an elevated blood pressure during pregnancy or puerperium as defined in 1986 by the American College of Obstetricians and Gynecologists and adopted by the World Health Organization (WHO) (1 - 4). Previous reports defined hypertension in pregnancy as a condition presented with a diastolic blood pressure of at least 90 *mmHg* or a systolic blood pressure of at least 140 *mmHg*, or a rise in diastolic blood pressure of at least 15 *mmHg* or a rise of 30 *mmHg* in systolic blood pressure (2, 3). In the obstetric condition, the Working Group recently defined hypertension in

pregnancy as a condition in which, the diastolic blood pressure is at 90 *mmHg* or above, or a systolic blood pressure is at 140 *mmHg* or above (5). Moreover, WHO considers only an elevated value of diastolic blood pressure as a criterion for defining the disorder (3). The disorder complicates 4-10% of pregnancies (6 - 10). The American College of Obstetricians and Gynecologists and the United Nations Organization recognize four categories of hypertension in pregnancy. These include chronic hypertension, gestational hypertension, preeclampsia/eclampsia, and superimposed preeclampsia/eclampsia, a condition defined as chronic hypertension complicated by preeclampsia/eclampsia (2 - 4).

Several studies have analyzed the risk factors for hypertensive disorders in pregnancy and the identified risk factors include obesity, a family history of hypertension, alcohol intake, heart failure, stroke and left ventricular hypertrophy and smoking (11 - 13).

A recent study at the Maroua Provincial Hospital revealed that hypertension in pregnancy was the first cause of maternal death, representing 17.5% of the 63 maternal deaths recorded between 2003 and 2005; however, little is known about the risk factors for hypertension in pregnancy in Cameroon, especially in the Far North Region (14).

The aim of this study was to identify the possible risk factors for hypertensive disorders in pregnancy, in order to propose specific preventive measures for the Far North Cameroon.

Methods

This case-control study evaluates hypertension in pregnancy in Far North Cameroon.

Design and site of the study: This case-control study was undertaken at the Maroua Regional Hospital, Cameroon. This hospital is a second level referral facility for the Far North Region. However, its obstetric care unit has insufficient personnel despite its high workload. During the years 2005-2007, there was one gynecologist, one midwife and six trained nurses assisted by four temporary assistant nurses. About four deliveries were carried out per day. Between 2003 and 2004, there were 3263 deliveries of which 144 (4.41%) were by cesarean section.

Population: In the present study, we considered, women with a diastolic blood pressure of at least 90 *mmHg* or a systolic blood pressure of at least 140 *mmHg* to have hypertensive disorder in pregnancy. During the study period (June 2005 to May 2007), we identified 176 cases of hypertension in pregnancy. We excluded 16 (9.1%) cases of twin gestations from our analysis. Among the remaining 160 cases, we excluded 8 women who had chronic hypertension, 152 cases were eventually analysed. For each case of hypertension in pregnancy, about 3 women who followed her in delivery and had no hypertension were retained as the controls. Overall, 414 women were recruited as the controls against 152 cases of the study.

Variables of interest: Data were collected on the socio-economic status (age, marital status, educational level, occupation, residence) of the participants.

Data management: The data were collected, tested and corrected for the study. Information from the files was read into MS Excel sheets, and stored in the database of the Department of Obstetrics and Gynecology of the Maroua Provincial Hospital.

Statistical analysis: Data analysis was performed using EPI Info 3.5.1. The conventional rule of thumb was applied and therefore, the chi^2 of heterogeneity was used in comparing the distribution of different obstetrical hypertension risks factors in the two study populations when appropriate. However, if an expected number was less than 5, we used an alternative, Fisher's exact test. Odds ratio with 95% confidence interval was used to appreciate the impact of different variables on the risk of presenting hypertension.

The analysis included means, range, standard deviation and proportions. The univariate analysis was conducted to identify the association of different variables on the risk of presenting hypertension in pregnancy. The multivariate analysis was used taking into account the potential confounding factors. The difference was considered significant if the p-value was less than 0.05.

Results

For a period of two years at the Maroua Regional Hospital, (June 2005 to May 2007), there were 3228 deliveries among which 176 were complicated by hypertension (5.45%). Among the overall 3228 deliveries, 60 had hypertension complicated by seizures (1.86%) but 116 did not (3.59%). Eleven women (6.25%) had elevated

Table 1. Classification of patients according to their socio-demographic and reproductive characteristics

Socio-demographic and reproductive characteristics	Preeclampsia/eclampsia N = 152, N (%)	No hypertension N = 414, N (%)	Total N = 566, N (%)	P-value
Age: Mean (SD) (Range)	23.5 (7.1) (14-42)	24.3 (6.4) (13-43)		
Age (groups)				
10-16 years	25 (16.4)	28 (6.8)	53 (9.4)	0.0128
17-19 years	32 (21.1)	82 (19.8)	114 (20.1)	
20-24 years	32 (21.1)	117 (28.3)	149 (26.3)	
25-29 years	32 (21.1)	92 (22.2)	124 (21.9)	
30-34 years	12 (7.8)	45 (10.8)	57 (10.1)	
35-44 years/ others	19 (12.5)	50 (12.1)	69 (12.2)	
Marital status				
Married	144 (94.7)	394 (95.3)	538 (95.0)	0.83
Others	8 (5.3)	20 (4.7)	28 (5.0)	
Husband				
Unmarried	7 (4.6)	16 (3.9)	23 (4.0)	0.8169
Polygamous	38 (25.0)	96 (23.2)	134 (23.7)	
Monogamous	107 (70.4)	302 (72.9)	409 (72.3)	
Education level				
None	74 (48.7)	148 (35.7)	222 (39.2)	0.0127
Primary	38 (25.0)	147 (35.6)	185 (32.7)	
Secondary/ University	40 (26.3)	119 (28.7)	159 (28.1)	
Socio-professional group				
Housewife	142 (93.5)	360 (87.0)	502 (88.7)	0.0313
Salary owne/ others	10 (6.5)	54 (13.0)	64 (11.3)	
History of ectopic pregnancy				
Yes	4 (2.6)	7 (1.7)	11 (1.9)	0.496*
No	148 (97.4)	407 (98.3)	555 (98.1)	
History of abortion				
Yes	34 (22.4)	99 (23.9)	133 (23.5)	0.7008
No	118 (77.6)	315 (76.1)	433 (76.5)	
Number of deliveries				
0	108 (71.1)	236 (57.0)	344 (60.7)	< 0.001
1	21 (13.8)	122 (29.5)	143 (25.3)	
≥ 2	23 (15.1)	56 (13.5)	79 (14.0)	
History of premature delivery				
No	149 (98.0)	407 (98.3)	556 (98.2)	0.732*
Yes	3 (1.8)	7 (1.7)	10 (1.8)	

*Fisher exact test

blood pressure before the 20th week of gestation.

When compared with women without hypertension, the pregnant patients with hypertension presented no difference regarding marital status (94.7% vs. 95.2%), history of abortion (22.4% vs. 23.9%) or history of premature delivery (1.8% vs. 1.7%). Meanwhile, women with hypertensive disorder in pregnancy were at early teenage years

Table 2. Classification of patients according to the personal and family history of hypertension

History of hypertensive disease	Preeclampsia/eclampsia N = 152, N (%)	No hypertension N = 414, N (%)	Total N = 566, N (%)	P-value
History of maternal hypertension				
Yes	14 (9.2)	20 (4.8)	34 (6.0)	0.0519
No	138 (90.8)	394 (95.2)	532 (94.0)	
History of brother/sister hypertension				
Yes	13 (8.6)	12 (2.9)	25 (4.4)	0.0037
No	139 (91.4)	402 (97.1)	541(95.6)	
History of paternal hypertension				
Yes	27 (17.8)	27 (6.5)	54 (9.5)	<0.0001
No	125 (82.2)	387 (93.5)	512 (90.5)	
History of hypertension in pregnancy				
Yes	22 (14.5)	9 (2.2)	31 (5.5)	<0.0001
No	130 (85.5)	405 (97.8)	535 (94.5)	
History of chronic hypertension				
Yes	8 (5.3)	4 (1.0)	12 (2.1)	0.0041*
No	144 (94.7)	410 (99.0)	554 (97.9)	

*Fisher's exact test

(16.4% vs. 6.8%) and in nulliparous status (71.1% vs. 57%) compared to control women. The illiteracy rate was also higher among the women with hypertension disorder (48.7% vs. 35.7%) (Table 1).

The number of patients with hypertensive disease in pregnancy was significantly greater in pregnancy when taking into account a personal history of hypertension in pregnancy (14.5% vs.2.2%), a personal history of chronic hypertension (5.3% vs.1.0%), a history of paternal hypertension (17.8% vs. 6.5%), or a history of hypertension for siblings (8.6% vs. 2.9%) (Table 2). No statistically significant differences were found between the two groups concerning the history of maternal hypertension.

Univariate analysis revealed (Table 3) a greater risk of having hypertension during pregnancy for the age group 13-16 years (OR: 2.6; 95%CI: 1.5-4.7; p= 0.0005), women without any school education (OR: 1.7; 95%CI: 1.1-2.4; p= 0.0052), housewives (OR: 2,8; 95%CI: 1.05-4.2; p= 0.0313), women with no previous deliveries (OR: 1.8; 95%CI: 1.2-2.7; p= 0.0024), women with histories of paternal hypertension (OR: 3.0; 95%CI: 1.7-5.4; p< 0.0001), women with histories of sibling hypertension (OR: 3.1; 95%CI: 1.3-7.0; p= 0.0037), women with histories of hypertension in pregnancy (OR: 7.6; 95%CI: 3.4-16.9; p< 0.0001), and women with histories of chronic hypertension (OR: 5.6; 95%CI: 1.6-19.1; p= 0.0016).

At multivariate analysis and after adjustment for different factors linked to the occurrence of hypertension, the risk of having hypertension during pregnancy remained greater for women without any school education (OR: 1.6; 95%CI: 1.0-2.3; p= 0.0117); housewives (OR: 2.8; 95%CI: 1.1-6.9; p= 0.0167); women with no previous deliveries (OR: 2.8; 95%CI: 1.5-3.6; p= 0.0001); women with histories of sibling hypertension (OR: 3.6; 95%CI: 1.6-8.5; p= 0.0014) and women with histories of hypertension in pregnancy (OR: 7.0; 95%CI: 3.0-16.4; p< 0.0001).

Table 3. Risk factors for developing hypertensive disorders in pregnancy

Variables	Total number of women (N)	Preeclampsia/ Eclampsia (N=152)	Rate (%)	(Odds Ratio)* (95% CI)	P-value	(Odds Ratio)** (95% CI)	P-value[x]
Age							
20-43 years	509	127	25.0	1[c]	0.0005	1[c]	-
13-16 years	53	25	47.2	2.6* (1.5 - 4.7)		-	
Education level							
Others	344	78	22.7	1[c]	0.0052	1[c]	0.0177
None	222	74	33.3	1.7* (1.1 – 2.4)		1.6[b] (1.0 – 2.3)	
Socioprofessional group							
Others	64	10	15.6	1[c]	0.0313	1[c]	0.0167
Housewife	502	142	28.3	2.8* (1.05 – 4.2)		2,8[d] (1,1-6,9)	
Number of deliveries							
≥1	222	44	19.8	1[c]	0.0024	1[c]	0.0001
No delivery	344	108	31.4	1.8* (1.2 - 2.7)		2.8[e] (1.5 - 3.6)	
History of paternal hypertension							
No	512	125	24.4	1[c]	0.0000	1[c]	-
Yes	54	27	50.0	3.0* (1.7 – 5.4)		-	
History of brother/sister hypertension							
No	541	139	25.7	1[c]	0.0037	1[c]	0.0014
Yes	25	13	52.0	3.1* (1.3 – 7.0)		3.6[f] (1.6 – 8.5)	
History of hypertension in pregnancy							
No	535	130	24.3	1[c]	0.0000	1[c]	0.0000
Yes	31	22	71.0	7.6* (3.4 - 16.9)		7.0[g] (3.0 - 16.4)	
History of chronic hypertension							
No	554	144	26.0	1[c]	0.0016	1[c]	0.2242
Yes	12	8	66.7	5.6* (1.6 – 19.1)		2.0[h] (0.5 – 7.5)	

*: Non adjusted OR; **: Adjusted OR; a: reference category; b: adjusted on socio-professional group; c: adjusted on level of education, number of deliveries, history of hypertension in siblings, history of hypertension in pregnancy; d: adjusted on continuous age and number of deliveries; e: adjusted on socio-professional group, history of hypertension in pregnancy, history of chronic hypertension; f: adjusted on education level; g: adjusted on number of deliveries, history of chronic hypertension; h: adjusted on socio-professional group, history of paternal hypertension, history of hypertension in pregnancy

Discussion

We conducted this study in order to identify the possible risk factors for hypertensive disorders in pregnancy in Maroua, Cameroon. We found that, the risk factors for hypertensive diseases in pregnancy in Maroua, Cameroon included early teenage status, illiteracy, housewife status, nulliparity, and family and the personal histories of hypertension.

The extreme ages of reproductive years are well-known risk factors for hypertension during pregnancy with high incidence rates in teenagers (15, 16).

Many authors have identified young age as a risk factor for hypertension during pregnancy, as is the case in the present study (17, 18). Adeyinka et al. found the prevalence of eclampsia and pre-eclampsia among adolescents to be 20% in comparison to only 3.33% among the controls (17). In another study, a 2.9% vs. 0.6% preeclampsia prevalence was reported in teenagers compared to women aged 25-34 years (18). In the present study, the number of early teenagers among patients with hypertension was 16.4% compared to 6.8% among the controls. We found that early teenage status (13-16 years) was associated with an increased risk for hypertensive disorders in pregnancy (OR: 2.6; 95%CI: 1.5-4.7; p= 0.0005). Similar findings were reported by Saftlas et al. (16) who revealed that black teenagers aged 15-17 years had 2.6-fold risk for preeclampsia compared to women aged 24-34 years.

Studies have reported that a higher age is also an important risk factor for hypertension in pregnancy, especially in developed countries (19, 20). Assis et al. (20) found that age above 30 years was associated with a risk for preeclampsia superimposed on chronic hypertension (OR: 5.218; 95% CI: 1.873 to 14.536) (20). A similar result was reported by Suzuki et al. (19) who found that, in singleton pregnancies, the developing preeclampsia was associated with maternal age 35 years or above. Both studies reported the association of infertility treatment with an increased risk for hypertensive disorders in pregnancy as this was also recently reported by Poon et al. (21), but Maroua, Cameroon is a semi-urban area and few women are likely to be under ovulation treatment.

In the present study, the percentage of women aged 35 to 44 years old was similar in the two study populations revealing that, this age group was not associated with an increased risk of hypertensive disorders in pregnancy. Some studies are necessary to understand better why there is lack of effect of the age progress on the occurrence of hypertensive disorders in pregnancy.

The absence of previous deliveries is widely reported as a risk factor for hypertensive disorders in pregnancy (19, 22, 23). Assis et al. (20) identified primiparity as a risk factor for gestational hypertension (OR: 5.435; 95% CI: 1.9-15.4). In the present study, we found that nulliparity was associated with a nearly 2-fold risk for hypertensive disorders in pregnancy (OR: 1.8; 95% CI: 1. 2-2.7). Our findings are in conformity with the aforementioned literature reports.

In the present study, women with at least two previous deliveries represented 15.1% vs. 13% when respectively comparing hypertensive to non-hypertensive women. Previous studies did find multiparity as a risk factor for hypertension in pregnancy, however, they reported an increased risk the nulliparous women had a different partner (24, 25).

We found that illiteracy was associated with about 2-fold risk for presenting hypertensive disorder in pregnancy (OR: 1.7; 95% CI: 1.1-2.4). The absence of school education, identified as an independent risk factor for hypertensive disorder in pregnancies, is well-documented in the literature (26, 27). Among the risk factors for preeclampsia Mittendorf et al. (28) identified less than a high school education (OR: 2.0, 95% CI: 1.1-3.6). The illiteracy rate in our population could influence the occurrence of hypertension in pregnancy by the simple reason that the low school level is associated indirectly to the precocious marriage and to limited access to health care, including family planning.

Even though some authors have not found any difference in pregnancy outcomes between housewives and employed women (29), most publications state that workers have adverse outcomes (30 - 32). In the present study, housewives had an increased risk for hypertensive disorder in pregnancy (OR: 2.8; 95% CI: 1.05-4.2). However, housewives, respectively, represent 93.4% and 87% in hypertensive and non-hypertensive study populations and could randomly influence the pregnancy risks.

Hypertension during pregnancy is also known to be an important risk factor for developing hypertension in pregnancy (23). Previous preeclampsia as an independent risk for superimposed preeclampsia was reported to be associated with about 5-fold increase for the risk (OR: 4.757; 95% CI: 1.261-17.938). A higher risk of hypertensive disorder in pregnancy was reported among women with previous hypertension in pregnancy (OR: 7.6; 95% CI: 3.4-16.9) (20).

Personal history of chronic hypertension is one of the reported risk factors for hypertensive diseases in pregnancy (21, 33). Family history of hypertension was identified as a risk factor for hypertension in Cameroon (11). However, little is known separately about histories of paternal, sibling or maternal hypertension, although we were able to illustrate that the last one is not a risk factor for hypertensive disease in pregnancy.

Some studies have reported body mass index and birth spacing as risk factors for hypertension in pregnancy, but those variables were not analyzed in the present study (34, 35).

Conclusion

Risk factors for hypertensive diseases in pregnancy in Maroua, Cameroon included early teenage status, illiteracy, housewife status, nulliparity, and family and personal histories of hypertension. Knowledge of risk factors for hypertensive dis-

orders in pregnancy may give tracks for prevention in the population of Maroua, Cameroon and beyond. Some more extended prospective studies are necessary to confirm our findings. The confirmation of these findings should help towards the development of the national strategies of hypertension in pregnancy prevention. Prevention must include campaigns and education from the medical and paramedical staff.

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