Research Article

Materno-Fetal Complications of Pre-Eclampsia at the Yaoundé Gynaeco-Obstetric and Pediatric Hospital

Bello Monkaree, Pascal Foumane, Julius Dohbit, Albert Amengle, Isidore Tompeen and Kamsu Moyo*

Faculty of Medicine and Biomedical Sciences, The University of Yaounde I, Cameroon

*Corresponding author: Kamsu Moyo, Faculty of Medicine and Biomedical Sciences, The University of Yaounde I, Cameroon.

Abstract

Introduction: Pre-eclampsia is characterized by the new onset of hypertension as from the 20th week of pregnancy, with a systolic blood pressure (BP) ≥ 140 mmHg and/or a diastolic BP≥ 90 mmHg and proteinuria (> 0.3 g/24h). It complicates 7-10% of all pregnancies and it's the first cause of maternal mortality at the Yaoundé Gynaeco-Obstetric and Pediatric Hospital in Cameroon. Our main objective was to evaluate maternal complications of pre-eclampsia at the Yaoundé Gynaeco-Obstetric and Pediatric Hospital. Methodology: We conducted a cross sectional and analytical study, from December 2017 to May 2018 at the gyneco-obstetric service and the intensive care unit. We included all women who presented with pre-eclampsia. Our data was analyzed using Epi info 7.0 software. Results: We censored 1310 deliveries and 83 patients were retained giving us a frequency of 6.49%. The average age was 28.4±5 years with extremes ranging from 15 to 43 years. Patients aged between 30 to 34 years were the most frequent. The maternal complications were eclampsia (31.3%), acute kidney injury (10.8%), abruptio placenta (9.6%), hypertensive retinopathy (6%), ascites (6%), HELLP syndrome (4.8%), pulmonary oedema (3.6%), postpartum hemorrhage (1.2%) and stroke (1.2%). The case fatality rate was estimated at 4.8%. The most frequent fetal complication was prematurity (34.9%), followed by stillbirth (13.3%) and oligohydramnios (8.4%). The fetal death rate was estimated at 9.9%. Factors associated with maternal complication of pre-eclampsia were: age< 20years (OR=10.7; IC=1.1-46.1), number of antenatal consultation less than 4 (OR=8.1; IC=2.3-35.7), antenatal consultation (ANC) by a nurse (OR=11.7; IC=7.9-22), reference from a peripheral health center (OR=12.9; IC= 3.6-30.9) and severe hypertension (OR=12.1; IC= 1.7-44.1). Conclusion: Pre-eclampsia remains frequent in our context. Eclampsia is the most common matcapacitation ofation, worsening maternal and fetal prognosis. Sensitization of pregnant women on the importance of antenatal clinic attendance and capacitation of district hospitals for maternal and neonatal resuscitation, could contribute to a reduction of the incidence of preeclampsia and the related maternal and fetal complications.

Keywords: Pre-eclampsia; Eclampsia; Complications; Risk factor

Introduction

Pre-eclampsia is characterized by the new onset of hypertension as from the 20th week of pregnancy, with a systolic blood pressure ≥ 140 mmHg and/or a diastolic blood pressure ≥ 90 mmHg and proteinuria (> 0.3 g/24) with or without edema [1]. Hypertension represents the first nosological group of cardiovascular pathology. It complicates 7 to 9% of all pregnancies and is a major risk factor during pregnancy [2]. It exposes both the mother and the fetus to multiple complications, some of which can be life-threatening. According to the World Health Organization, pre-eclampsia is the first cause of maternal death during pregnancy in developed countries and the third cause in Africa after hemorrhage and infections [3,4]. Pre-eclampsia occurs in 3-14% of all pregnancies worldwide. In the United States of America, it accounts for 5-8% and around 3-5% in Western Europe. Around 75% of cases are

mild forms and 25% of cases are severe forms [5]. Pre-eclampsia in sub-Saharan Africa is a major problem in gynecology and obstetrics services. Its prevalence is between 1.4% and 11.6% according to the authors. The last study carried out at the "Centre Hospitalier" de Libreville in 2008 reported a prevalence of 11.6% [6-10]. In Cameroon, Mboudou et al found the prevalence of pre-eclampsia was around 4.97% [11].

According to a study conducted by Fatima B, 27.94% of patients had one or more obstetrical histories with miscarriages and in utero fetal demise. A past history of pregnancy induced hypertension and eclampsia was present in 5.32% of cases. Gestational diabetes was found in 0.36% of cases. According to literature review, patients with history of pregnancy-induced hypertension, pre-eclampsia, fetal death in utero or other complications of pregnancy-induced hypertension have a high risk of developing a second episode of the disease and especially in its severe forms. This can be identified from the start of pregnancy [12]. Other risk factors include: Excess weight, diabetes, cesarean section, multiple pregnancies, anti-phospholipid syndrome, autoimmune diseases, kidney diseases, inter-birth delay, family history, low socioeconomic level [11,12]. According to Tebeu, et al. in Cameroon, patients aged below 20, nulliparity, low educational standards, personal and/or family history of high blood pressure are considerable risk factors for developing pre-eclampsia [13].

In terms of maternal morbidity and mortality, the main complications of pre-eclampsia were represented by eclampsia in 37.37%, HELLP syndrome (12.7%), bilateral complete blindness (1.9%), acute renal failure (13.3%), infections (8.2%), retroplacental hematoma (3.8%), disseminated intravascular coagulation (3.1%), acute lung edema (3.8%), postpartum hemorrhage (1.9%) and maternal death (2.9%) [2,11,14].

Reducing maternal mortality is one among the Sustainable Development Goals. However, the maternal mortality rate remains very high in Africa, especially in the subsaharan region [15]. Eclampsia is the leading cause of maternal mortality at the Yaoundé Gynaeco-Obstetric and Pediatric Hospital with a fatality rate of 2.9% [11,16]. On this basis, it seemed interesting for us to conduct a study on the maternal complications of pre-eclampsia at the Yaoundé Gynaeco-Obstetric and Pediatric Hospital in order to enable decision-makers to develop strategies that can provide appropriate and effective solutions to reduce the incidence of preeclampsia and its complications.

Methodology

This was an observational study with cross-sectional analytical design that was carried out at the gynecology, obstetric and anesthesia-resuscitation departments of the Yaoundé Gynaeco-Obstetric and Pediatric Hospital. It extended over a period of 6 months from December 18, 2017 to May 18, 2018. It comprised all women with pre-eclampsia admitted in the hospital during the study period. Patients were recruited consecutively. The minimum sample size was calculated using the Cochrane formula [17]. Based on results from a previous study conducted by Mboudou et al in Cameroon in 2009, the prevalence of pre-eclampsia was

4.97% [11]. Hence the minimum sample size estimated for our study was 72 patients. We included all women with pre-eclampsia with or without complications that were hospitalized and having consented. We excluded all women who refused to participate in the study. We obtained research authorization and ethical clearance from the Yaoundé Gynaeco-Obstetric and Pediatric Hospital. We then proceeded to identify patients in whom the diagnosis of pre-eclampsia was made. Information was obtained by interview while exploring complementary data from prenatal consultation books, delivery room registry and medical files. This data was transcripted into pre-established technical sheet. The variables analyzed were: Age, educational level, profession, marital status, socio-economic, gestational formula, birth space, number of prenatal consultations, gestational age, clinical assessment, biological assessment, maternal complications and fetal complications. Study data were entered and analyzed using Epi Info 7.0 software. The tables were drawn up using Microsoft Office Excel and Word 2013 software. The comparison of variables was carried out using Chi-square and Fischer's exact tests. The error threshold was set at 5% as statistically significant for each variable studied. The association between the variables and the pathology was made using the odds ratio (or Odds Ratio) expressed with its 95% confidence interval. A multivariate analysis was performed to eliminate confounding factors.

Results and Discussion

Limits of the study

We conducted an observational study with an analytical cross-sectional design which is not ideal for patient follow-up and so could not permit thorough and continuous evaluation of all maternal complications related with pre-eclampsia in time and space. This may have limited our findings as compared with longitudinal or cohort study designs.

Incidence

In this survey, the incidence of pre-eclampsia was 6.49%. This is similar to that obtained by Swati et al. in 2014 in Nigeria which was 6% [18,19]. However, it is lower than 10.6% obtained by Diallo, et al. in 2018 in Senegal [20]. This difference could be explained by the heterogeneity of the populations at risk and also by the type of study they conducted, which was a retrospective study carried out over a period of 4 years. Unlike other studies conducted across the African continent and in other developed countries, a much lower frequency of 3.2.% was found by Jian, et al. in 2012 in the United States of America [21]. This could be explained by the low socioeconomic level of patients in developing countries, being responsible for early marriages, low level of education and unwanted pregnancies which are all characteristics particularly encountered in Africa as well. Another reason could be weak health policies due to poor decision making or reluctance of the politics to make use of research data in the development of health strategies [22]. We noted the incidence of pre-eclampsia was higher in the month of May at 15.9%. In effect, pre-eclampsia, occurs in the middle of the rainy season in our context, which spans from March to June for the short rainy season. The resurgence of pre-eclampsia

during the cold season is a fact previously noted by Assogba, et al. in Senegal in 2005 and other studies as well [23-25]. This is probably explained by the fact that cold and humidity may lead to vasoconstriction and/or the production of vasoactive substances such as endothelin, hence the occurrence of pre-eclampsia (Figure 1).
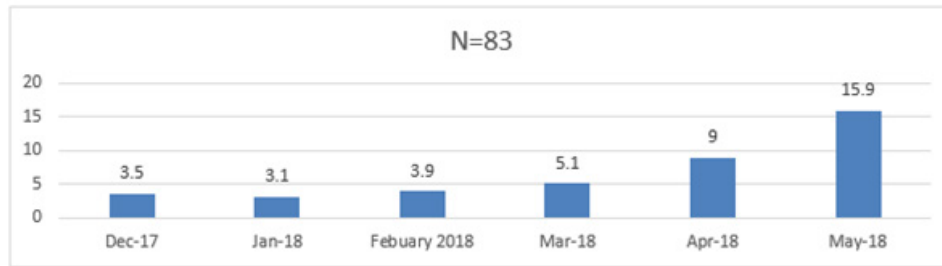

Figure 1: Distribution of patients over time.

The average age of the patients was 28.3 ± 5 years with extremes of 15 to 43 years. This is similar to findings obtained by Nguefack, et al. in 2015 in Cameroon which was 31 ± 5.4 years [14]. While Saker, et al. in 2017 in Nigeria found an age range within 26 ± 5.77 years [26]. In our series, the most represented age group was between 30 and 34 years (32.5%). This result is similar to that found by Mboudou et al. in 2009 in Cameroon, which revealed 33% of cases [11]. Most of our patients had reached the university level of education in 38.6%. This is also similar to Mboudou et al's findings [11]. This could be due to the fact that the majority of our patients delayed their maternity to favor their education with considerable level of studies duration. This can justify the high frequency of primigravida and elderly nulliparous in our study sample. However, Tebeu et al found in Maroua that the majority of patients in his series had a low level of education [13]. This difference could be explained by an unequal distribution of education means from one region to another, among which in the northern regions of Cameroon are less favored [27]. About 72.1% of the women in our sample were single. Swati et al. in 2014 in Nigeria made the same observation [19]. However, Tebeu et al in Maroua, Cameroon in 2011 reported that the majority of patients were married [13]. This corroborates with observations made by Olivier et al in Ngaoundéré in Cameroon in 2016 [29]. The variation of findings with regards to this data could be explained by the socio-cultural diversity of the study population. As a matter of fact, the low level of education is often related to a high frequency of early marriages and vice-versa, as described in the latter studies [13,29]. Most of our patients had a low socioeconomic level in 56.6% of cases. According to related literature findings, low socioeconomic standards is cited as a risk factors of pre-eclampsia [30,31]. This could be explained by the fact that the low socioeconomic level would be indirectly linked to the low level of education, early marriages and low accessibility to family planning, hence with higher fertility rate in this group of patients [32].

Clinical presentation

In our series, most pre-eclamptic patients were primigravidae (34.9%) and nulliparous (48.2%). Similar results were observed by several authors and could be explained by short exposure to their partners' sperm. A history of pre-eclampsia was present in 13.3% of cases. This result is close to some findings from Nigeria, which varied between 5 to 10% [26]. Some studies report a higher risk of preeclampsia in patients with a history of hypertensive disease during pregnancy [13,33]. Most of our patients (50.6%) had less than 4 antenatal consultations during their pregnancies and 47% of patients started consulting after the 16th week of amenorrhea. These results are not far different from those of Belley Priso et al in Cameroon in 2009, who found 54.3% of cases [34]. Doumbia et al in Mali in 2010 reported 86.4% patients with less than 4 antenatal consultations [35]. However, the WHO recommends at least 8 ANC during a well followed pregnancy [36]. The low level of antenatal consultations could be explained by unfavorable socio-economic standards, not allowing women benefit quality prenatal consultations. According to the Cochrane review, the administration of preventive treatment such as aspirin with a dose of 50 to 75 mg per day in patients with risk factors for pre-eclampsia, before the onset of placentation could reduce the occurrence of pre-eclampsia by 15% [37].

Maternal complications

Maternal complications were frequent in our study in 48.1%. Eclampsia was the most common maternal complication occurring in 31.3% of cases. This result is in line with that of Diallo et al in Senegal in 2017, which was 24.9% of cases occupying the first position [20]. However, it is much higher than that obtained by Mboudou et al in 2009, which was 4.8% of cases [11]. The incidence of eclampsia was estimated at 1.9%, contrary to values found by Doumpouo, et al. in 2006 which was 0.92% of cases [38]. This observation may pertain to two reasons; the first being the lack of quality antenatal consultations and the second the fact that most patients were referred from remote hospital centers, having been the subject to treatment attempts, which is often a source of delay to adequate treatment. Acute renal failure came in second among maternal complications with 10.8% cases. This result is consistent with those of Nguefack, et al. in Cameroon in 2015 who found 13.2% of cases [14]. Chobli, et al. in Mali in 2013 found 14.7% of

cases [39]. The retroplacental hematoma came in third position of complications with 9.6% of cases. This result is lower than that of Diallo, et al. in Senegal in 2017 who had a frequency of 24.6%. The difference may be related with the type of study and the sample size, which was a retrospective study with a larger sample size than ours with a possible concentration effect of such cases [20]. HELLP syndrome was also a frequent complication of preeclampsia in 4.8% of cases. This result corroborates with that of Chobli, et al. in Mali in 2013 who reported 5.3% of cases [39]. However, it is lower than that of Nguefack et al in Cameroon in 2015 which was 12.6% of cases. This difference could once more be explained by the sample size, which was larger in their cases [11]. In our series we had 4 (4.8%) maternal deaths related to the occurrence of eclampsia. Mboudou et al in 2009 in Cameroon had earlier found 2.9% of maternal deaths which shows an increment [11] (Table 1).

Table 1: Distribution of patients according to maternal complications.

Maternal complications	N=83	
	n	%
Eclampsia	26	31.3
Acute renal failure	9	10.8
Retro placental hematoma	8	9.6
Hypertensive retinopathy	5	6
Ascites	5	6
HELLP-syndrome	4	4.8
Acute lung edema	3	3.6
Postpartum hemorrhage	1	1.2
Stroke	1	1.2
Maternal deaths	4	4.8

HELLP: Hemolysis Elevated Liver enzymes and Low Platelet

Fetal complications

The analysis of fetal complications shows that prematurity ranks first, having occurred in 34.9% of our patients. Thirteen fetal deaths were recorded with 9.9% fetal mortality, divided into 7 cases of fetal in utero death and 6 neonatal deaths. Monitoring of intrauterine growth retardation was performed in 13.3% of cases. These figures are much higher than those of Mboudou et al in Cameroon in 2009, who had 13.5% of prematurity and 7.7% of fetal mortality rates [11] (Table 2).

Table 2: Distribution of patients according to fetal complications.

Fetal complications	N=83	
	n	%
Premature	29	34.9
Intrauterine growth retardation	11	13.3
In-utero fetal death	7	8.4
Oligoamnios	7	8.4
Acute fetal distress	1	1.2
Neonatal deaths	6	7.2

Factors associated with the occurrence of maternal complications of preeclampsia

We found that age < 20 years increased the risk of eclampsia by 10.7 (OR=10.7; CI=1.1-46.1). This result is similar to that of Tebeu et al in Maroua, Cameroon, who found a risk increase of 8.5 folds [13]. This group of patients essentially comprised adolescents who in majority of cases lack financial autonomy, causing poor perinatal follow-up. The low socioeconomic level multiplied by 10.5 the risk of manifesting complication (OR: 10.5; 95% CI: 4.0-38.6). According to Fouedjio et al in Cameroon, this risk was multiplied by 17.6 in their series [17]. This could be due to low patients' accessibility to quality antenatal consultations because of poverty. In effect, having performed less than 4 prenatal consultations multiplied the risk by 8.1 folds (OR=8.1; CI=2.3-35.7) for maternal complication of pre-eclampsia. Among the patients who had maternal complications, approximately two-thirds had less than four antenatal consultations. This result is comparable with that of Doumpouo et

al in Cameroon and Diallo et al in Senegal who reported that being unbooked or having less than 4 prenatal consultations were risk factor associated with the occurrence of eclampsia [20,36]. Prenatal consultations allow the prevention of pathologies in pregnancy and complications, as well as communication for change in behavior. The WHO recommends at least 8 ANC [36]. In this survey, the risk for maternal complication of pre-eclampsia was 11.7 folds in patients who were being followed by a nurse (OR=11.7; CI=7.9-22). This result is similar to that of Fouedjio, et al. in Cameroon in 2017 who found a risk increase of 9.3 folds [18]. This could be explained by expertise insufficiency or inexperience in early diagnosis of high-risk pregnancies and delayed referral for better care. The risk for maternal complication of pre-eclampsia was

multiplied by 12.9 in patients referred from remote or peripheral hospitals centers (OR=12.9; CI=3.6-30.9). This result corroborates with those reported by a number of authors in various contexts and may be due to referral and management delays [37-39]. We also found that severe hypertension increased the risk for maternal complications by 12.1 folds (OR=12.1; CI=1.7-44.1). This seemed coherent with several other research findings worldwide reporting associations between severe hypertension and the occurrence of maternal complications of pre-eclampsia [18,20]. Moreover, it is known that sudden rises of blood pressure cause vasogenic edema, and hence the occurrence of pre-eclampsia complications including eclampsia, hypertensive retinopathy and acute pulmonary edema [41-43] (Table 3).

Table 3: Multivariate analysis.

Features	Cases N=40	Control N=43	OR	P
	n (%)	n (%)		
Age<20ans	09(34,6)	04(07,1)	10,7 (1,1-46,1)	0,044
Nombre of ANC <4	20(50,0)	13(30,2)	08,1(2,3- 35,7)	0,008
Followed by a nurse	16(40,0)	08(18,6)	11,7 (7,9-22,0)	0,002
Referred	30(75,0)	15(34,9)	12,9 (3,6-30.9)	0,013
≥160/110mmHg	34(85,0)	23(53,5)	12,1 (1,7-44,1)	0,041

ANC= Antenatal Consultation

Conclusion and Recommendations

By the end of our study, we can conclude that maternal complications of pre-eclampsia at the Yaoundé Gynaeco-Obstetric and Pediatric Hospital are frequent. They mainly affect single, nulliparous and primigravid patients, with a low socioeconomic level and with poor quality antenatal consultations. The factors associated with the occurrence of maternal complications are the age < 20 years, the number of antenatal consultations <4, having performed antenatal consultations with a nurse, being referred from a health facility, and being affected with severe hypertension. Therefore, it seems important to ensure good training of nurses in order to enable them identify high risk pregnancies and be able to timely refer towards gynecologist and obstetricians for better care. This would automatically include proper booking for a minimum of 8 antenatal consultations with qualified personnel. Furthermore, the creation of well-equipped and trained services for maternal and neonatal resuscitation in remote hospitals, would greatly improve the prevention of complications.

Acknowledgement

Conflict of Interest

Authors declare no conflict of interest.

References

1. (2013) The American College of Obstetricians and Gynecologists-Task Force on Hypertension in Pregnancy. Hypertension in pregnancy. In: Library of Congress Cataloging-in-Publication Data.

2. Cabrol D, Pons J, Goffinet F (2008) Traité d'obstétrique, Flammarion médecine-sciences. 1ère édition, 2èmetirage: 554-565.

3. Villar J, Say L, Shennan A, Lindheimer M, Duley L, et al. (2004) Methodological and technical issues related to the diagnosis, screening, prevention, and treatment of pre-eclampsia and eclampsia. Int J Gynaecol Obstet 85(1): 28-41.

4. Abalos E, Cuesta C, Grosso AL, Chou D, Say L (2013) Global and regional estimates of pre-eclampsia and eclampsia: a systematic review. Eur J Obstet Gynecol Reprod Biol 170(1): 1-7.

5. (2000) American College of Obstetricians and Gynecologists. ACOG practice Bulletin #3. Diagnosis and Management of Pre-eclampsia and Eclampsia. January 2002 and Working Group Report on High Blood pressure in Pregnancy. National Institutes of Health, Washington Dc, USA.

6. Cissé C, Thiam M, Diagne PM, Moreau J (2005) Pré-éclampsie en milieu africain. Épidémiologie et pronostic en CHU de Dakar. Lettre Gynécol 301: 8-13.

7. Bah AO, Diallo MH, Diallo AAS, KéitaN, Diallo MS (2000) Hypertension artérielle etgrossesse: aspects épidémiologiques et exacts de risques. Méd Afr Noire 47: 422-425.

8. Thiam M, Goumbola M, Gning S (2003) Pronostic maternité et foetal dans l'association hypertension et grossesse en Afrique subsaharienne. J Gynecol Obstet Biol Reprod 23: 35-38.

9. Hyjazi Y, Diallo M, Barry M, Kéita N (1999) La Toxémie gravidique : aspects épidémiologiques, cliniques et pronostiques en service de gynécologie-obstétrique du CHU Donka Burkina Méd 3(1-2): 90-97.

10. Sanon A (1993) La pré-éclampsie : aspects épidémiologiques, cliniques, thérapeutiques et pronostiques. [Thèse de Médecine], Université des Sciences de la Santé. Libreville 620:110P.

11. Mboudou E, Foumane P, Priso E, Dohbit J, Minkande J, et al. (2009) Hypertension au cours de la grossesse : Aspects cliniques et épidémiologiques à l'Hôpital Gynéco-Obstétrique et Pédiatrique de Yaounde Cameroun. Clin Mother Child Health 6(2): 1087-1093.

12. Fatima BO (2009) Epidémiologie de l'hypertension artérielle gravidique : A propos de 544 cas. [Thèse de Médecine] Université de Cadi Ayyad Marrakech: 27-151.

13. Tebeu P, Foumane P, Mbu R, Fosso G, Biyaga PT, et al. (2011) Risk Factors for Hypertensive Disorders in Pregnancy: A Report from the Maroua Regional Hospital, Cameroon. J Reprod Infertil 12(3): 227-234.

14. Tchente NC, Belley PE, Halle EG, Fofack TL, Nana NT, et al. (2015) Complications et prise en charge de la pré-éclampsie sévère et de l'éclampsie à l'hôpital général de Douala Cameroun. Rev Méd Pharm 5(1): 484-489.

15. Hogan MC, Foreman KJ, Naghavi M, Ahn SY, Wang M, et al. (2010) Maternal mortality for 181 countries, 1980-2008: a systematic analysis of progress towards Millennium Development Goal 5. Lancet 375(9726): 1609-1623.

16. Foumane P, Dohbit J, Ngo U, Meka E, Nkada M, et al. (2015) Etiologies de la Mortalité Maternelle à l'Hôpital Gynéco-Obstétrique et Pédiatrique de Yaoundé: Une Série de 58 Décès. Health Sci. Dis 16(3).

17. Lenth RV (2001) Some Practical Guidelines for Effective Sample Size Determination. Am Stat 55(3): 187-193.

18. Fouedjio JH, Foumane P, Fouogue JT, Ndenga VJ, Fouelifack FY, et al. (2017) Predictors of eclampsia among pre-eclamptic patients: a case control study in Yaounde, Cameroon. Int J Reprod Contracept Obstet Gynecol 5(7): 2204-2209.

19. Singh S, Ahmed EB, Egondu SC, Ikechukwu NE (2014) Hypertensive disorders in pregnancy among pregnant women in a Nigerian Teaching Hospital. J Niger Med Assoc 55(5): 384-388.

20. Bah AO, Diallo MH, Dialloa AS, Keita N, Diallo MS (2000) Hypertension artérielle et grossesse : Aspects épidémiologiques et facteurs de risques .Méd Afri Noir 47(10): 422-423.

21. Jian Gong ,David A Savitz, Cheryl R Stein, Stephanie M Engel (2012) Maternal ethnicity and pre-eclampsia in New York City 1995-2003 Paediatric and Perinatal Epidemiology 26(1): 45-52.

22. Osungbade KO, Ige OK (2011) Public Health Perspectives of Preeclampsia in Developing Countries: Implication for Health System Strengthening. J Pregnancy 2011: 481095.

23. Assogba Schola (2005) La pré-éclampsie a l'Hôpital de la mère et de l'enfant-Lagune(Homel) de Cotonou [Thèse] Faculté de Médecine de Pharmacie et d'Odontostomatologie.

24. Attolou V, Takpara I, Akpovi J, Avode G, Nida M, et al. (1998) Les différents types d'hypertension artérielle chez les femmes enceintes béninoises admises au CNHU de Cotonou : Cahier de santé (8): 353-356

25. Beaufils M (1994) Hypertension gravidique Encyl. Méd. Chir. Cardiologie-angéologie, 11-303K-10, Paris: 1-9

26. Sarker S, Nazma S, Most L, Lobaba S, Md F, et al. (2017) Pregnancy Induced Hypertension and Associated Factors among Pregnant Women. J Gynecol Womens Health 30(3) 1-6.

27. Bilé P-C (2009) Entre refus de l'école et scolarisation à tout prix. Les parents et l'école au Cameroun. Cah Rech Sur L'éducation Savoirs 1(8): 153-170.

28. Zusterzeel PL, te Morsche R, Raijmakers MTM, Roes EM, Peters WH, et al. (2002) Paternal contribution to the risk for pre-eclampsia. J Med Genet 39(1): 44-45.

29. Olivier PM, Diallo C, Marcel TT, Chantal Blakga, Armel HN, et al. A Study on Factors Related to Hypertensive Disorders in Pregnancy in Ngaoundéré. Clin Med Research

30. Kimbally KG, Barassoumbi H, Buambo SF, Gombet T, Kibeke P, et al. (2007) Arterial hypertension: epidemiological aspects and risk factors on pregnant and delivered woman. Dakar Med 52(2): 148-152.

31. Poon LCY, Kametas NA, Chelemen T, Leal A, Nicolaides KH (2010) Maternal risk factors for hypertensive disorders in pregnancy: a multivariateapproach. J Hum Hypertens 24(2): 104-110.

32. Johnson-Hanks J (2003) Éducation, ethnicité et pratiques reproductives au Cameroun, Abstract, Resumen. Population 58(2): 171-200.

33. Assis TR, Viana FP, Rassi S (2008) Study on the major maternal risk factors in hypertensive syndromes. Arq Bras Cardiol 91(1): 11-17.

34. Belley Priso E, Njamen TN, Coulibaly A, Mboudou E, Doh A (2013) L'éclampsie A L'Hôpital General De Douala: Aspects Épidémiologiques Et Pronostiques. Health Sci Dis. 10(4).

35. Doumbia (2010) L'hypertension artérielle et grossesse dans le service de gynécologie obstétrique du Centre de Sante de Reference de la Commune VI [thèse]. Faculté de Médecine de Pharmacie et d'Odontostomatologie Université de Bamako.

36. Carroli G, Villar J, Piaggio G, Khan-Neelofur D, Gülmezoglu M, et al. (2001) WHO systematic review of randomised controlled trials of routine antenatal care. Lancet 357(9268): 1565-1570.

37. Knight M, Duley L, Henderson DJ, King JF (2002) Antiplatelet agents for preventing and treating pre-eclampsia. The Cochrane Rev 4: 1-3.

38. Dempouo Nguelefack L (2006) Césarienne ou accouchement par voie basse dans l'éclampsie: Quel est le devenir materno-foetale?: Faculté de Médecine et des Sciences Biomédicales Yaoundé I.

39. Chobli H (2013) Evaluation de la prise en charge anesthésiologie de l'éclampsie au chu du point g. Faculté de Médecine de Pharmacie et d'Odontostomatologie de l'université de Bamako: 19-92.

40. Hypertensive Disorders in Pregnancy (2005) Cunningham FG, Levenno KJ, Bloom SL, Hauth JC, Gilstrap III LC, Wenstrom KD (edts), Williams Obstetrics. 22nd edition, McGraw-Hill Companies, New York, USA: 34.

41. Zeeman GG, Hatab MR, Twickler DM (2004) Increased cerebral blood flow in preeclampsia with magnetic resonance imaging. Am J Obstet Gynecol 191(4): 1425-1429.

42. Belfort MA, Saade GR, Grunewald C, Dildy GA, Varner MA, et al. (1998) Effects of blood pressure on orbital and middle cerebral artery resistances in healthy pregnant women and women with preeclampsia. Am J Obstet Gynecol 180(3 Pt 1): 601-607.

43. Zeeman GG, Fleckenstein JL, Twickler DM, Cunningham FG (2004) Cerebral infarction in eclampsia. Am J Obstet Gynecol 190(3): 714-720.