Rationale of a Cross-Sectional Descriptive Study on Temporal Evolution of Frequency, Risk Factors and Complications of Preeclampsia in the University Clinics of Kinshasa, DR Congo

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Abstract

Background: Knowledge of temporal evolution of preeclampsia (PE) in its various aspects is essential in strategies to reduce maternal and perinatal morbidity and mortality. Preeclampsia is a public health problem due to maternal mortality associated with it worldwide (5.6%). Improving quality of its management is a major challenge in low-income countries where, despite progress made in this field, PE remains a major factor in maternal morbidity and mortality. **Objective:** To evaluate temporal evolution of frequency, risk factors and complications of PE at the University clinics of Kinshasa (UCK). **Methods:** Descriptive and cross-sectional study concerning minimum simple size of 119 pregnant women who consulted for antenatal care at the University clinics of Kinshasa from January 2012 to December 2022. Results will be reported as percentage proportion, mean and standard deviation. Comparison of proportion and means between groups will be made using Student's t-test and Pearson's chi-square test, respectively. The test will be statistically significant for a p value ≤ less than 0.05. Data will be collected and analysed anonymously and confidentially. **Conclusion:** This study will allow us to evaluate the effectiveness of different prevention and treatment modalities used over time in management of preeclampsia in our setting.

Keywords

Temporal Evolution, Preeclampsia, Frequency, Risk Factors, Complications

1. Introduction

Preeclampsia (PE) is defined by the International Society for the *Study of Hypertension during Pregnancy* (ISSHP) as the occurrence of arterial hypertension (AH) for the first time from the twentieth gestational week characterized by a systolic blood pressure (SBP) ≥ 140 mmHg and/or a diastolic blood pressure (DBP) ≥ 90 mmHg, measured on at least two occasions 4 hours apart, in a previously normotensive woman associated with target organ dysfunction of either neurological (convulsions, blindness, intracranial hemorrhage), renal (proteinuria, oligoanuria), hepatic (elevated transaminases, liver rupture), hematological (hemolysis, thrombocytopenia) or placental (fetal growth restriction, fetal death) order [1] [2] [3]. Its prevalence varies according to the population studied, a country's level of development and the diagnostic approach used, so that it is estimated globally at between 3% and 5% of pregnancies [4] [5]. In the DRC, the reported prevalence is 8.5% [6].

Its etiology remains poorly understood due to the complex pathophysiological mechanisms reported in the form of theories (vascular, endothelial, immune, inflammatory, etc.) leading to a placentation disorder often occurring in early pregnancy [1] [3] [7].

Pre-eclampsia is a major public health problem worldwide because of its maternal-perinatal consequences, particularly in developing countries where it is the second leading cause of maternal mortality after delivery haemorrhage [1] [3] [8] [9] [10] [11].

For several decades, measures have been taken to reduce this scourge by initiating studies aimed at taking stock of this pathology with regard to its epidemiology, the risk factors involved in its occurrence, the means of prevention, the evaluation of therapeutic modalities as well as its complications, but the fact remains that we note in the literature a variation in PE in relation to frequency, risk factors (RF) and complications [12] [13].

This is the case of Roberts et *al*, in an international comparative study carried out from 1997 to 2007 in seven countries (Australia, Canada, Denmark, Norway, Scotland, Sweden and the United States) on the demographic trends of PE. For the duration of their study, they described an average annual decrease in the rate of PE in the majority of countries: 6% in Australia; 3% in Scotland; 2.5% in Norway; 1.2% in Sweden and 0.7% in Denmark, but a significant increase was observed in the USA of 2.4% per year [14]. In Africa, on the other hand, a fairly high rate of PE is reported at base, varying sharply upwards, as in a study carried out in Cameroon, which found an overall prevalence of 23.5% in 2016, rising to 48.3% in 2020 [15] [16].

Trends in RF and complications have been variously reported in the literature, depending on region, study period and statistical significance. Nevertheless, some have been found to predominate and vary in most settings, such as chronic hypertension, nulliparity, multiparity and advanced age, as reported in studies in the USA [17], Norway [18], Taiwan (China) [19], Nigeria [20] and Cameroon [15].

Similarly, certain complications of PE, both maternal and perinatal, are predominant, with different variations over time, notably acute renal failure (ARF), HELLP Syndrome and abruptio placentae (AP) on the maternal side, and prematurity, intra uterine growth restriction (IUGR) and intra uterine fetal death (IUFD) more common on the maternal side, as reported in the USA [21] [22], France [23] [24], Nigeria [25] and Cameroon [26].

Improving the quality of management, as well as the management of maternal-perinatal outcomes of PE by providers, remains a major challenge in low- and middle-income countries, where despite decades of progress in studies concerning its epidemiology, the RF involved in its occurrence, the evaluation of both preventive and curative management modalities, as well as its complications, PE retains a significant maternal-perinatal morbi-mortality in both resource-limited and developed countries. We therefore need to examine its temporal impact in terms of frequency, risk factors and complications in UCK.

2. Objective

The aims of the study will be to evaluate temporal evolution of the frequency of PE, its risk factors and complications at the University clinics of Kinshasa.

2.1. Rationale for the Study

To address the question of temporal evolution of the frequency of PE, its risk factors, and its complications at the University Clinics of Kinshasa, our study will be conducted at the University Clinics of Kinshasa (UCK) from January 2010 to December 2022. Our study population will consist of the medical records of pregnant women treated for pre-eclampsia at the hospital during the study period. We will utilize the maternity, delivery room, emergency room, and operating room registers.

2.2. Methods of the Study

2.2.1. Sample Size

This will be a descriptive cross-sectional study with a minimum sample size calculated according to the SCWARTZ formula [27] that is, $n \geq \dfrac{Z^2 \times P \times q}{d^2}$. In this formula, n is the minimum sample size, z is the confidence interval (1.96), p is the assumed proportional prevalence of the problem in the population equal to 8.5%, q is the proportion of people without a problem ($q = 100 - p$) and d is the degree of precision set at 0.05. After incorporating these elements into the formula, the minimum size of our calculated sample will be at least 199 files. This study is designed and will be financed from our own funds.

2.2.2. Selection of Service Providers

1) Inclusion criteria

The study will include all records of pregnant women managed for preeclampsia during the study period and containing at least 50% of the study va-

riables.

2) Non-inclusion criteria

Files not found and those containing less than 50% of the study variables will not be included in this study.

2.2.3. Variables of the Study

1) Socio-demographic variables: age, occupation, tribe, province of origin, marital status, level of education, socioeconomic level, smoking, alcoholism.

2) Clinical variables: weight, height, BMI, parity, gestational age, abortions, family and personal history of hypertension, PE and diabetes.

3) Pregnancy-related variables: date (year) and age of pregnancy at PE diagnosis, type and severity of PE, PE impact assessment, elements of PE severity, PE complications, elements of PE management, delivery parameters (delivery route: vaginal or caesarean section), newborn parameters (birth age, APGAR, birth weight, perinatal complications).

2.3. Data Collection Procedures

After obtaining authorization from the Department and the Faculty, we will begin by identifying the pregnant women managed for PE in the registers of the maternity ward, delivery room, emergency room and operating theatre, then search the records of the pregnant women in order to transcribe the information collected in the data collection forms.

2.4. Expected Results of the Study

At the end of the present study, the current frequency of PE and its temporal evolution in UCK will be determined; the risk factors and complications of preeclampsia in UCK will be identified; and finally, the temporal evolution of the risk factors and complications of preeclampsia in UCK will be described.

2.5. Statistical Considerations

Data will be entered using Microsoft Excel 2019 and then exported to a database in *Statistical package for social sciences* (SPSS) version 22.0 for analysis. Results will be expressed as percentage proportion and mean plus or minus standard deviation.

Comparisons of means between groups will be made using *Student*'s T-test or analysis of variance (ANOVA) as appropriate for quantitative variables, and comparisons of proportions will be made using Pearson's Chi-square test. The test will be considered statistically significant for a value of $p <$ less than 0.05.

2.6. Ethical Considerations

This project was approved by the staff of the Department of Gynecology-Obstetrics and by the Ethics Committee of the School of Public Health of the University of Kinshasa. Data collection for this study will be confidential, and the data will be processed and published anonymously.

3. Discussion

Pre-eclampsia contributes to maternal and perinatal morbidity and mortality and remains a major obstetric concern as well as a significant global public health threat, particularly in developing countries. Several studies worldwide indicate an increasing trend in terms of its frequency, risk factors, and complications [11] [12] [17] [28]. Notably, Ananth *et al.* [29] in USA found in their study on the prevalence of pre-eclampsia that the rate had slightly increased, from 3.4% in 1980 to 3.8% in 2010. Similarly, Klungsøyr *et al.* reported an increase in the prevalence of pre-eclampsia from 2% in 1967 to 3.6% in 2008 over a 40-year period [18]. In Africa, studies show a strong upward trend. For instance, a study in Ethiopia conducted by Wagnew *et al.* over 5 years noted an increase in the rate from 2.2% in 2009 to 5.58% in 2013 [30]. In Ghana, Adwoa *et al.* recorded a prevalence increase from 4.6% in 2018 to 6.6% in 2020 over a 3-year period [31], while in Nigeria, Onoh *et al.* reported a prevalence increase from 2.9% to 5.2% over a 6-year period [20].

Regarding the trend of risk factors, in the USA [32], in 2008, pregestational diabetes was the predominant risk factor with a prevalence of 40%, while four years later in 2012, maternal age between 20 and 29 years was reported as the predominant risk factor at 53%. Chronic hypertension and multiparity, ranked in the same order of priority during both study periods, saw their rates significantly decrease from 32% to 17% and 24% to 4%, respectively.

In Norway, Sole *et al.* [12] identified age ≥ 35 years, nulliparity, and twin pregnancies as predominant risk factors. These risk factors remained the most prevalent and increased over all study periods except for twin pregnancies, whose frequency remained nearly constant at 14.5% to 20.4%; 40% to 42%; and 1.8% to 1.6% from 1999 to 2018, respectively. In Africa, in 2011 [33] in Nigeria, nulliparity was reported as the predominant risk factor at 44%, which maintained the same position in 2017 [20] with a decrease in prevalence from 44% to 32%. However, chronic hypertension shifted from the third to the second position but with a decrease in prevalence from 19% to 15%.

Maternal Maternal age between 25 and 29 years (42%) and a family history of hypertension (9%) were ranked second and third, respectively, during both the first and second study periods.

Several trends have also been observed concerning maternal and perinatal complications of pre-eclampsia in the literature. In France [23] [24], the same maternal and perinatal complications were reported in the same order of predominance and all characterized by an increase in their prevalence. For instance, HELLP Syndrome (15% to 47%), hypertensive retinopathy (1% to 10%), and acute renal injury (10%) all experienced a rise in their prevalence. Perinatal complications included intrauterine growth restriction (14% to 63%), intrauterine fetal death (1% to 20%), and neonatal death (10%), which was only observed in the second period. In Nigeria [25] in 2012, maternal complications included pulmonary edema at 5%, while four years later [20], hypertensive retino-

pathy was found at a rate of 11%.

Chronic hypertension remained constant at 2.4%. Thirdly, disseminated intravascular coagulation (2.4%) and HELLP Syndrome (2%) were reported. As for perinatal complications, in 2011 [34], intrauterine fetal death (11%) and neonatal death (9%) were observed, while in 2017 [25], perinatal asphyxia (36%), low birth weight (48%), and acute respiratory distress syndrome (19%) were identified.

The improvement of quality of pre-eclampsia management and management of maternal and perinatal outcomes by healthcare providers remains a significant challenge in low- and middle-income countries. Despite advancements in studies spanning decades regarding the epidemiology, risk factors, preventive and curative management modalities, as well as complications of pre-eclampsia, it continues to contribute to substantial maternal and perinatal morbidity and mortality in both resource-limited and developed countries. This justifies the need to explore its temporal impact in terms of frequency, risk factors, and complications at UCK.

3.1. The Strength of the Study

Our study will be the first to investigate temporal evolution of the frequency of PE, its risk factors and complications at the University clinics of Kinshasa. It will therefore serve as a reference for future studies. This study will enable us to evaluate the various preventive and curative management methods that have been used for several years by various obstetricians at the University clinics of Kinshasa.

3.2. The Limits of the Study

Missing data and the difficulty of identifying other risk factors and complications could affect the accuracy of the results. However, although it cannot fully reflect the PE trend for the whole country, our sample will be representative of part of the city of Kinshasa, and future studies should take this into account.

4. Conclusion

This study will fill the gap in studies on temporal evolution of PE, and will also, in view of the data provided, draw the attention of practitioners in general and obstetricians in particular to the management of PE, which could improve the management of this problem.

Authors' Contributions

MMA and NOC are the principal investigators. MMA generated and designed the study. NOC participated in the study design and will be actively involved in data collection. MMA, LMEP, LAJ, MNF, LMEP, KNB, LBJ, LNN and MFM contributed to the drafting and improvement of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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