



The silent threat: investigating the incidence and clinical characteristics of pre-eclampsia and eclampsia in women from tertiary care hospitals of the Democratic Republic of Congo

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Background: Pre-eclampsia and eclampsia are medical conditions that can cause severe complications, such as maternal and foetal morbidity and mortality. This study aimed to assess the incidence and characteristics of pre-eclampsia and eclampsia.

Methods: From July 2021 to July 2022, the authors conducted a retrospective, cross-sectional, descriptive study in the Department of Obstetrics and Gynaecology of a tertiary care hospital in the Democratic Republic of the Congo (DR Congo). Out of 1236 total deliveries, 40 patients aged 18–35 years with pre-eclampsia and/or eclampsia with complete data in medical records were studied.

Results: In the studied group, 3.23% of women (40 cases) experienced pre-eclampsia or eclampsia, with the majority (75%, 30 cases) occurring before childbirth. Among these, 62.5% (25 cases) were first-time mothers. The main complications observed in the mothers included HELLP syndrome and placental abruption, whereas their newborns frequently exhibited delayed in-utero growth. Caesarean delivery was the prevalent birthing method, and the treatments most often used for effective management were magnesium sulfate and nicardipine.

Conclusion: The research highlights the common occurrence of eclampsia among patients in the DRC and stresses the critical need for prompt detection of hypertensive complications during pregnancy, aiming to reduce negative health impacts on both mothers and their children.

Keywords: eclampsia, hypertension, pre-eclampsia, pregnancy, women health

Introduction

Eclampsia, an intense manifestation of pre-eclampsia, may cause morbidity and even subsequent mortality for both the mother and the foetus if it is left undiagnosed and inadequately managed at an early stage. It is one of four hypertensive disorders identified during pregnancy^[1]. Untreated pre-eclampsia can persist for a short period of time before abruptly worsening into

eclampsia^[1,2]. Pre-eclampsia and eclampsia typically develop after 20 weeks of gestation and occasionally progress into the postpartum period^[3,4]. Eclampsia is defined as the new onset of generalized tonic-clonic seizures in a woman with prior pre-eclampsia^[4].

Pre-eclampsia, defined as new-onset hypertension with systolic blood pressure greater than or equal to 140 mmHg and diastolic blood pressure greater than or equal to 90 mmHg alongside

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unexplained proteinuria (> 300 mg/24 h after 20 weeks gestation or a urine protein/creatinine ratio ≥ 0.3) following 20 weeks gestation, occurs in almost 2–8% of pregnant individuals^[1,2,5]. Additionally, the severity of the disease may present with clinical manifestations affecting one or more target organs, such as the kidneys, liver, central nervous system, lungs, and blood vessels^[1,5]. Characteristic signs include severe headache, visual disturbances, confusion, epigastric or right hypochondrial abdominal pain, nausea and/or vomiting, dyspnoea (i.e. reflecting pulmonary oedema or cardiac dysfunction secondary to increased afterload), cerebrovascular disease/stroke, and oliguria (i.e. reflecting acute ischaemic tubular necrosis)^[1,2,5].

Eclampsia is a medical emergency and requires immediate medical attention to prevent maternal and foetal compromise^[6]. Despite advances in the management of eclampsia, it remains the leading aetiology of maternal and perinatal morbidity and mortality worldwide. Although the incidence of eclampsia has decreased substantially, it remains a very serious complication of pregnancy^[6–8]. Globally, 830 women die daily from pregnancy or childbirth-related pathologies. The persistent causes of mortality in women of reproductive age were haemorrhage (18%), unsafe abortion (18%), hypertensive disorders (12%), and sepsis (9%), among others (43%). Fatalities surmounting 92% occur in countries with extremely low incomes, and poorer women residing in rural domiciles are commonly implicated^[9–11]. Patients with eclampsia also have an increased risk of developing Cardiovascular disease later in life^[12]. Patients can also suffer from diplopia, permanent visual disturbances, and fluctuating cognition^[13].

Although there are existing data on the incidence and characteristics of pre-eclampsia and eclampsia, it is important to update the existing knowledge on risk factors and the evolution of disease trends and patterns, as well as geographic region, population variations, and ethnicities, in DR Congo. Thus, we conducted a cross-sectional, retrospective, descriptive study of patients admitted with eclampsia to determine the clinical relevance of the findings and validate the findings.

Methods

Study area, design and ethical considerations

This retrospective study was conducted from July 2021 to July 2022 at the Obstetrics and Gynaecology Department of the tertiary care centre in DR Congo and aimed to explore the epidemiological and clinical characteristics of eclampsia and pre-eclampsia in pregnant women. Ethical approval was obtained from the Ethics Review Board of the Faculty of Medicine (Ref/0225/CNES003/DPSK/2022 and the approval letter UNILU/CEM/236/2022), aligning with the 1964 Declaration of Helsinki and its amendments.

Data collection

A confidential chart review was performed without the need for informed consent, considering the retrospective nature of the study. Patient identification data were blinded for confidentiality. The demographic, clinical, laboratory, and management information of 40 patients (aged 18–35 years) with pre-eclampsia and/or eclampsia and their newborns were extracted from maternal admission registries.

HIGHLIGHTS

- Eclampsia, a severe form of pre-eclampsia, may cause morbidity and even subsequent mortality for both the mother and the foetus if left undiagnosed and mismanaged at an early stage.
- Eclampsia is one of four types of hypertensive disorders observed during pregnancy.
- Pre-eclampsia and eclampsia are two medical conditions affecting pregnant populations which may precipitate serious complications, such as maternal and foetal morbidity and mortality.
- Pre-eclampsia and eclampsia develop following 20 weeks gestation, and occasionally into the postpartum period.

Sampling method and analysis

From July 2021 to July 2022, 40 out of 1236 deliveries involving pre-eclampsia and eclampsia were identified, and complete data were available in the registries. The inclusion criteria included confirmed cases of eclampsia and/or pre-eclampsia who delivered within the time frame within the reproductive age group of 18–35 years. Epidemiological and clinical variables, including demographic factors, maternal age, hospital distribution, obstetrical factors (parity and gestational age), period of onset of eclampsia, frequency of seizures, incidence of proteinuria, and management, including mode of delivery, were collated, analyzed, and presented using Microsoft Word and Excel. The study adhered to the STROSS criteria^[14], and the Fig. 1 shows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Flow Chart.

Results

Our study included 1236 women, 40 of whom participated during childbirth and displayed signs of pre-eclampsia or eclampsia, suggesting that their condition was relevant. In comparison to other disorders observed in the Department of Gynecology and Obstetrics throughout the research period, pre-eclampsia and eclampsia affected our patients at a rate of 3.23%. Figure 2 shows the distribution of severity of these hypertensive disorders in the study population, with 40% ($n=16$) of those patients having eclampsia.

Table 1 summarizes the sociodemographic characteristics of the patients. The study predominantly included patients aged between 31 and 35 years (32.5%, $n=13$) and women with a history of Goma (72.5%, $n=29$). Table 2 lists the various background variables studied in the population. Approximately 62.5% ($n=25$) were primiparous women, and ~27.5% ($n=11$) had gestational ages between 31 and 35 weeks (or between 36 and 40 weeks each). More than three-fourths (75%, $n=75$) of the women suffered from pre-eclampsia and eclampsia during the antepartum period.

Table 3 explains the various maternal and foetal complications noted in the study population.

While 62.5% ($n=25$) developed more than one seizure, 27.5% ($n=11$) developed only one seizure, and 10% ($n=4$) did not develop even one episode. Regarding clinical presentations, 72.5% ($n=29$) of the women exhibited pedal oedema, 80% ($n=32$) had persistent headaches, and 77.5% ($n=31$) were

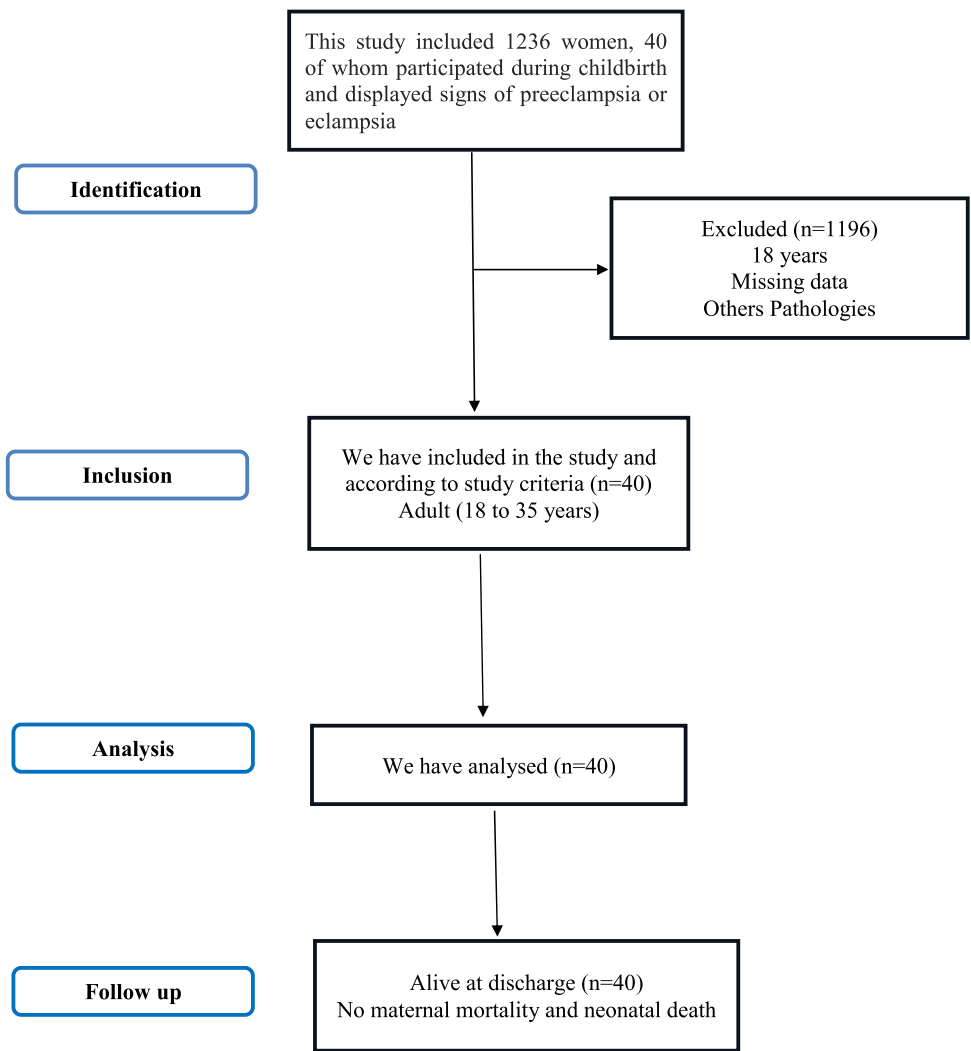


Figure 1. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) flow chart.

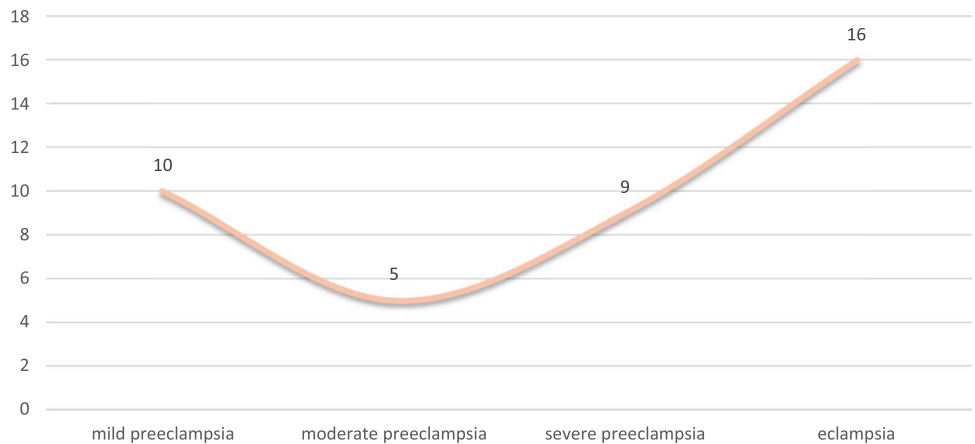


Figure 2. The distribution and frequency of the different stages of eclampsia.

Table 1
Socio-demographic data

Variable	Effective (percentage), n (%)
Age group of cases registered	
18–20 years	5 (12.5)
21–25 years	11 (27.5)
26–30 years	11 (27.5)
31–35 years	13 (32.5)
Distribution among the population of eastern region of DR Congo	
Bukavu	11 (27.5)
Goma	29 (72.5)
Total	40 (100)

oliguric. Proteinuria was measured semiquantitatively using a urine dipstick and was recorded as 0.3 grams per 24 hours in 60% of women ($n=24$), 0.2 g per 24 h in 27.5% of women ($n=11$) and 0.1 g per 24 h in 12.5% of women ($n=5$). While 52.5% ($n=21$) of our cohort delivered their child via caesarean section, 47.5% ($n=19$) of the women delivered vaginally.

Magnesium sulfate (MgSO₄) was the most commonly used anticonvulsant for seizures, while nicardipine was an anti-hypertensive for our patients with pre-eclampsia and eclampsia. While 67.5% ($n=27$) of our female patients were followed up in the gynaecology and obstetrics department, 32.5% ($n=13$) were followed up in critical care. During the course of our research, there were no instances of maternal mortality or early or late neonatal deaths.

Discussion

In our study, we observed a higher frequency of signs indicating pre-eclampsia complicated by eclampsia among women aged 31–35 years, primarily primiparous and concentrated in the city of Goma. The occurrence of pre-eclampsia was notably significant during the antepartum period.

Eclampsia is a major contributor to maternal morbidity and mortality, and perinatal complications vary across countries, especially in developing nations. Our study revealed an incidence of pre-eclampsia combined with eclampsia of 3.23%, aligning with the findings of *Kampo et al.*^[15] and comparable to rates

Table 2
Background characteristics of patients with pre-eclampsia and Eclampsia

Variables	Effective (percentage), n (%)
Distribution of parity for the women	
Primiparous	25 (62.5)
Multiparous	15 (37.5)
Gestational age	
20–25 weeks	8 (20)
26–30 weeks	10 (25)
31–35 weeks	11 (27.5)
36–40weeks	11 (27.5)
Period of onset of pre-eclampsia and eclampsia	
Antepartum	30 (75)
Pre-partum	6 (15)
Postpartum	4 (10)
Total	40 (100)

Table 3
Maternal and foetal complications of pre-eclampsia and Eclampsia

Complications (n = 40)	Effective (percentage), n (%)
Maternal complications	
HELLP syndrome	4 (10)
Placental abruption	6 (15)
Coma	2 (5)
Retro-placental haematoma	11 (27.5)
Postoperative infection	10 (25)
Acute renal failure	7 (17.5)
Foetal complications	
Intrauterine growth retardation	12 (30)
Foetal death <i>in utero</i>	6 (15)
Premature deliveries	11 (27.5)

reported in other African countries. A heightened frequency of pregnancy disorders is linked to late consultation and inadequate pregnancy monitoring in developing countries, with appreciable differences in individual protocols^[16,17].

Examining the epidemiological profile of our patients, we noted a concentration of pre-eclampsia among those aged between 31 and 35 years (32.5%). Between 31 and 35 weeks of gestation, 62.5% of the patients were diagnosed with pre-eclampsia, and 75% of the patients were diagnosed with eclampsia. These outcomes parallel those of other studies, where the majority of affected women were typically between 20 and 30 years of age^[16,17]. The incidence of eclampsia was greater in primiparous women than in multiparous women^[18], consistent with findings by *Belay et al.*^[19]

Our study confirmed the progression from pre-eclampsia to eclampsia during pregnancy, with all selected patients experiencing pre-eclampsia before the patient experienced eclamptic crises. Notably, 5% of the patients experienced coma during our study, emphasizing the severe complications of pre-eclampsia^[2,3]. Maternal and foetal complications such as acute renal failure, HELLP syndrome, retro-placental haematoma, and intrauterine growth retardation in children were consistent with previous literature^[11,18,20].

Eclampsia is a life-threatening emergency for both mothers and children and necessitates prompt delivery. In our study, 52.5% of patients terminated their pregnancy by caesarean section, consistent with the findings of *Belay et al.*^[19]. The effective management of pre-eclampsia and eclampsia involves anticonvulsants for seizure prevention or treatment, control of blood pressure using antihypertensive agents, and timely delivery. On the basis of our study, we applied MgSO₄ as the primary treatment for eclampsia, in accordance with the previous literature^[20]. Antihypertensive drugs play a crucial role in preventing hypertension-related damage to the placenta, thereby reducing the risk of foetal growth restriction and early mortality^[21,22].

Lastly, based on the above findings, it is clearly evident that several strategies are to be implemented to enhance the medical treatment system for hypertensive disorders in pregnancy in DR Congo. These include rigorous monitoring protocols for at-risk pregnant women, conducting educational programs to increase awareness amongst healthcare providers and antenatal women, improving access to antenatal care, developing standardized treatment guidelines, adopting a multi-disciplinary approach involving various specialists, emphasizing postpartum follow-up

for affected women, and continuing research efforts to innovate and improve care^[23,24]. The novelty element in the study is the fact that such studies at institutional set-ups are mandatory to identify common practices and also delineate the errors. These measures would collectively aim to ensure early detection, timely intervention, comprehensive management, ultimately leading to better maternal and neonatal outcomes.

Strengths

Comprehensive coverage: The study's comprehensive review of a year's data from a tertiary care centre provides a solid foundation for understanding the incidence and characteristics of pre-eclampsia/eclampsia in the region.

Focused population: By concentrating on a specific age group with complete medical records, the study ensures the reliability and relevance of its findings.

Significant clinical insights: The identification of common complications and treatments offers valuable insights for clinical practice, particularly in resource-limited settings.

Limitations

Retrospective design: The study's retrospective nature may limit the ability to establish causality between observed factors and pre-eclampsia/eclampsia incidence.

Sample size and generalizability: With a relatively small sample size ($n=40$), the findings may not be fully generalizable to all populations within the DR Congo or other settings with similar healthcare challenges.

Potential for bias: The reliance on medical records might introduce bias if the records are incomplete or inaccurately documented.

Future directions

Further research should aim to expand the study's geographic and demographic scope, incorporating prospective designs to better understand the causal factors behind pre-eclampsia/eclampsia. Additionally, exploring the effectiveness of different management strategies in reducing maternal and foetal morbidity and mortality would be valuable.

Conclusion

Pre-eclampsia and eclampsia are potentially life-threatening disorders prevalent during pregnancy and particularly affect young women aged 18–35 years in the eastern region of the DR Congo. These conditions pose a substantial public health challenge due to their frequent occurrence, elevating the risk of maternal and foetal morbidity and mortality in the presence of serious complications. It is important to update the existing knowledge on risk factors and the evolution of disease trends and patterns to develop better preventive strategies for local communities.

Ethical approval

The study protocol was reviewed and approved by the Ethics Review Board of the faculty of medicine of the University of Lubumbashi in DR Congo following the relevant approval letters, respectively: Ref/ 0225/CNES003/DPSK/2022 and the approval letter: UNILU/CEM/236/2022. This study was

performed in accordance with the ethical standards as laid in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Consent

Written informed consent was obtained from the patient for publication and any accompanying images. The study design incorporated the separation of patient identification data by confidentiality codes to maintain anonymity and protect the privacy of the participants. Informed consent was obtained from all participants involved in the study.

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Author contribution

Conceptualization: O.N. Data curation: H.C. Formal analysis: G.M. Funding acquisition: O.N. Investigation: H.C. Methodology: M.O.O. and A.A. Project administration: O.N. Resources: T.A. Software: L.K., Supervision: M.O.O. Validation: G.M. Visualization: A.A. Writing—original draft: O.N., N.M. and T.K.S., Writing—review and editing: O.N., V.K.C. and A.A. Final approval of manuscript: all authors.

Conflicts of interest disclosure

The authors declare that there no conflict of interest.

Research registration unique identifying number (UIN)

1. Name of the registry: aymar akilimali.
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3. Hyperlink to your specific registration (must be publicly accessible and will be checked): <https://www.researchregistry.com/browse-the-registry#home/>.

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Data availability statement

Not applicable.

Provenance and peer review

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References

- [1] Wilkerson RG, Ogunbodode AC. Hypertensive disorders of pregnancy. *Emerg Med Clin* 2019;37:301–16.
- [2] Sutton AL, Harper LM, Tita AT. Hypertensive disorders in pregnancy. *Obstet Gynecol Clin* 2018;45:333–47.
- [3] Poon LC, Shennan A, Hyett JA, *et al.* The International Federation of Gynecology and Obstetrics (FIGO) initiative on pre-eclampsia: a pragmatic guide for first-trimester screening and prevention. *Int J Gynaecol Obstet* 2019;145(suppl 1):1–33.
- [4] Nzelu D, Dumitrascu-Biris D, Nicolaidis KH, *et al.* Chronic hypertension: first-trimester blood pressure control and likelihood of severe hypertension, preeclampsia, and small for gestational age. *Am J Obstet Gynecol* 2018;218:337–e1.
- [5] American College of Obstetricians and Gynecologists Gestational Hypertension and Preeclampsia: ACOG Practice Bulletin, Number 222. *Obstet Gynecol* 2020;135:e237–60.
- [6] Piccoli GB, Torreggiani M, Crochette R, *et al.* What a paediatric nephrologist should know about preeclampsia and why it matters. *Pediatr Nephrol* 2022;37:1733–45.
- [7] Casas R, Castro Barquero S, Estruch R. Impact of sugary food consumption on pregnancy: a review. *Nutrients* 2020;12:3574.
- [8] Meazaw MW, Chojenta C, Muluneh MD, *et al.* Systematic and meta-analysis of factors associated with preeclampsia and eclampsia in sub-Saharan Africa. *PLoS ONE* 2020;15:e0237600.
- [9] Sripad P, Kirk K, Adoyi G, *et al.* Exploring survivor perceptions of pre-eclampsia and eclampsia in Nigeria through the health belief model. *BMC Pregnancy Childbirth* 2019;19:1–.
- [10] Zegeye B, Ahinkorah BO, Ameyaw EK, *et al.* Disparities in use of skilled birth attendants and neonatal mortality rate in Guinea over two decades. *BMC Pregnancy Childbirth* 2022;22:56.
- [11] Sharrow D, Hug L, You D, *et al.* Global, regional, and national trends in under-5 mortality between 1990 and 2019 with scenario-based projections until 2030: a systematic analysis by the UN Interagency Group for Child Mortality Estimation. *Lancet Glob Health* 2022;10:e195–206.
- [12] Deer E, Jones J, Cornelius DC, *et al.* Progesterone induced blocking factor reduces hypertension and placental mitochondrial dysfunction in response to sFlt-1 during pregnancy. *Cells* 2021;10:2817.
- [13] Szczepanski J, Griffin A, Novotny S, *et al.* Acute kidney injury in pregnancies complicated with preeclampsia or HELLP syndrome. *Front Med* 2020;7:22.
- [14] Mathew G, Agha R. for the STROCSS Group. STROCSS 2021. Strengthening the Reporting of cohort, cross-sectional and case-control studies in Surgery. *Int J Surg* 2021;96:106165.
- [15] Kampo MI, Sogoba S, Kassogué D, *et al.* Maternal and perinatal prognosis of eclampsia at the Timbuktu Hospital in Mali. *Pan Afr Med J* 2020;36:175.
- [16] Fajardo Tornes Y, Nápoles Méndez D, Alvarez Aliaga A, *et al.* Predictors of postpartum persisting hypertension among women with preeclampsia admitted at carlos manuel de céspedes teaching hospital, Cuba. *Int J Women's Health* 2020;12:765–71.
- [17] Berhe AK, Kassa GM, Fekadu GA, *et al.* Prevalence of hypertensive disorders of pregnancy in Ethiopia: a systemic review and meta-analysis. *BMC Pregnancy Childbirth* 2018;18:1.
- [18] Traoré SA, Sylla M, Cissouma A, *et al.* Epidemiology and management of 144 eclampsia patients at Sikasso Hospital. *Sch J App Med Sci* 2021;9: 1339–42.
- [19] Belay Tolu L, Yigezu E, Urgie T, *et al.* Maternal and perinatal outcome of preeclampsia without severe feature among pregnant women managed at a tertiary referral hospital in urban Ethiopia. *PLoS ONE* 2020;15:e0230638.
- [20] Diassana M, Dembele S, Macalou B, *et al.* Eclampsia, the leading cause of maternal death in the gynecology and obstetrics department of the Fousseyni Daou Hospital (Kayes). *Health Sci Dis* 2020;21:15–9.
- [21] Duffy J, Cairns AE, Richards-Doran D, *et al.* A core outcome set for preeclampsia research: an international consensus development study. *BJOG* 2020;127:1516–26.
- [22] Al-Rubaie ZTA, Hudson HM, Jenkins G, *et al.* Prediction of pre-eclampsia in nulliparous women using routinely collected maternal characteristics: a model development and validation study. *BMC Pregnancy Childbirth* 2020;20:23.
- [23] Wang J, Yang Zi. Key points to early action for preventing and monitoring the syndrome of preeclampsia. *Maternal-Fetal Med* 2021;3:81–6.
- [24] Nkamba DM, Vangu R, Elongi M, *et al.* Health facility readiness and provider knowledge as correlates of adequate diagnosis and management of pre-eclampsia in Kinshasa, Democratic Republic of Congo. *BMC Health Serv Res* 2020;20:926.