



Research to Estimate Ten-year Contribution of Eclampsia to Maternal Mortality at a Tertiary Level Health Facility, Makurdi, Benue State, North-Central Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/121398>

Original Research Article

Received: 02/06/2024

Accepted: 05/08/2024

Published: 08/08/2024

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Cite as: Agulebe, Joseph Chiahemba, Omoregie Irowa, Michael Tyodoo Maanongun, Isaac Lahaga Nombur, and Paulinus Abu. 2024. "Research to Estimate Ten-Year Contribution of Eclampsia to Maternal Mortality at a Tertiary Level Health Facility, Makurdi, Benue State, North-Central Nigeria". *Asian Research Journal of Gynaecology and Obstetrics* 7 (1):219-28. <https://journalarjgo.com/index.php/ARJGO/article/view/229>.

ABSTRACT

Background: Eclampsia is responsible for over 50,000 maternal deaths with incidence of 1 death in about 100 - 1500 deliveries in developing nations. It is a severe pregnancy complication associated with high maternal and perinatal morbidity and mortality especially in low resource countries. Nigeria accounts for the highest maternal mortality ratio of 512 deaths per 100,000 live deliveries and eclampsia is one of the major contributors to maternal mortality in this country.

The Objective: The Objective of this study is to estimate the prevalence, types and causes of maternal mortality due to eclampsia.

Materials and Methods: This was a retrospective descriptive study involving 1,523 cases of eclampsia related complications at the Federal Medical Centre (FMC), Makurdi, Benue State, North Central, Nigeria over a 10-year period from January 2011 to December 2020. A pre-designed proforma was used to extract data from the Hospital records which include sociodemographic characteristics of the patients, type of eclampsia, time of presentation to the facility and complications to determine the prevalence, types, and causes of maternal mortality associated with eclampsia. Data was analyzed using SPSS version 25. Ethical approval was obtained from the Institution Health Research Ethics Committee of FMC, Makurdi.

Results: Eclampsia accounted for 46.8% of maternal deaths with a prevalence of 3.5% and with the case-fatality rate of 10% during the study period. The highest prevalence of eclampsia was observed among patients who were in the age group of 15-19 years of age (37.3%). The primigravidae (57.5%) and those with no formal education (76.5%) residing predominantly in rural communities (86.9%) were observed to be worst affected. Furthermore, the majority of patients who died due to eclampsia-related complications were un-booked for antenatal care (94.1%). The occurrence of Eclampsia was more frequent during the antepartum period (71.2%). The leading cause of death in eclampsia cases was pulmonary edema (47.1%).

Conclusion: Eclampsia remains a significant cause of maternal morbidity and mortality. Promoting antenatal care and hospital delivery is crucial in reducing the burden of eclampsia.

Keywords: Eclampsia; maternal mortality; tertiary health facility; North Central Nigeria.

1. INTRODUCTION

“Eclampsia is responsible for over 50,000 maternal deaths with incidence of 1 death in about 100 - 1500 deliveries in developing nations. In sub-Saharan Africa nations especially Nigeria, accounts for the highest maternal mortality ratio of 512 deaths per 100,000 live deliveries and the highest neonatal fatality of 67 per 1000 live births” [1]. “Factors such as teenagers, nulliparity, multifetal gestation, un-booked cases, preterm delivery, lack of proper access to antenatal care, poor hospital care, financial constraints, low socioeconomic status of many families, poor transport services, lack of ambulance services and inappropriate diagnosis, have all been identified as risk factors promoting eclampsia” [1,2]. “Eclampsia remains the leading contributor to maternal mortality, particularly in developing countries accounting for the death of about 50,000 women annually” [1,2]. “It is a very serious complication of pregnancy and is responsible for high maternal and perinatal morbidity and mortality. Eclampsia is an acute and life-threatening pregnancy complication characterized by generalized tonic-clonic seizures, usually in a woman who has developed

pre-eclampsia in the absence of any underlying neurological disorder” [1,3]. “Eclampsia-related complications include cerebrovascular accident, pulmonary oedema, renal failure, HELLP (haemolysis, elevated liver enzyme, and low platelet count) syndrome, disseminated intravascular coagulopathy, hepatic failure, cerebral oedema and maternal mortality” [4-6]. “Although eclampsia could be prevented and treated, it is a frequent cause of severe maternal and fetal complications with associated deaths in low and middle-income countries” [1].

“The prevalence of eclampsia and its associated mortality differ from one region to another. Similarly, the rates of maternal death associated with eclampsia are estimated to range between 0% and 1.8% in developed countries, but extremely high in low resource nations especially in sub-Saharan African nations” [1,2]. “After a study on the prevalence and mortality of eclampsia across 24 countries from 3 continents, the high maternal mortality in Africa was attributed to the poor initial diagnostic capabilities, lack of early referral, sociocultural belief hindering early presentation to the health care center, high level of illiteracy, poor initial

case management and unavailability or inaccessibility of good hospital services” [1]. According to the National Population Commission 2018 survey data in Nigeria [7], compare to other developing countries in sub-Saharan Africa, Nigeria has the highest maternal mortality ratio of 512 deaths per 100,000 live deliveries, highest neonatal fatality of 67 per 1000 live births and also the highest fertility rate of 5.3 children per woman. “Consequently, eclampsia had become a leader in the maternal and neonatal fatalities and further worsened the occurrence of complicated maternal and fetal outcomes” [1,7].

“Mortality from eclampsia is relatively rare in developed countries because of effective antenatal screening programmes, advanced diagnostic and therapeutic intervention and extensive research [6-8]. The incidence in the UK is about 2.7 per 10,000 deliveries, and an incidence of 1 in 3,704 was reported from Nova Scotia, Canada” [4,7,8]. “The reported incidence in developing countries varies widely from about 1 in 12 to 1 in 1,700 deliveries” [5-8]. “Eclampsia continues to be a very serious problem and mortality from eclampsia is still very high in developing countries” [8]. “The case fatality ratio of eclampsia ranges from 0 to 1.8 % in high-income countries to 17.7 % in middle-income countries such as India” [4,5]. “Indeed, while no maternal death due to eclampsia occurred in one year in the entire country of Sweden, one hospital in India reported 11 eclampsia-related deaths” [8-11]. “Recent reports emanating from Nigeria implicate eclampsia as the leading cause of maternal mortality contributing to 31.9%–46.4% of maternal deaths” [6,9].

“Eclampsia continues to be one of the leading cause of maternal and perinatal morbidity and mortality in Sub-Saharan Africa despite several global and regional interventions as well as initiatives from governments and international agencies to reduce this burden” [10]. Therefore, this present study aims to estimate the prevalence, types, and causes of maternal mortality related to eclampsia at Federal Medical Centre, Makurdi (FMC), North Central, Nigeria.

2. MATERIALS AND METHODS

This was a retrospective descriptive study conducted in the Obstetrics unit of the Department of Obstetrics and Gynaecology, FMC, Makurdi, Benue State, Nigeria. All the patients with eclampsia managed in the Labour Ward and Obstetrics Emergency Unit of the

Department between January 1st, 2011, and December 31st, 2020 were reviewed. The hospital numbers were retrieved from the Obstetrics ward register, labour ward register and Obstetrics emergency register and used to retrieve the case notes from the Medical Record Department. A pre-designed proforma was used to extract data from the Hospital records which include sociodemographic characteristics of the patients, type of eclampsia, time of presentation to the facility and complications to determine the prevalence, types, and causes of maternal mortality associated with eclampsia. Also, data related to the mode of management, and mortality were recorded using a pre-designed proforma. The patients’ relations did not accept postmortem examinations in all the recorded deaths from eclampsia. Thus, the causes of death were based on clinical examinations and findings in all the cases. Data were analyzed using SPSS version 25 and presented in tables and charts.

3. RESULTS

There were 43,359 admissions into the Obstetrics unit of the Department of Obstetrics and Gynecology of the FMC, Makurdi. Among these, 2351 were admitted with eclampsia-related complications, giving a prevalence of 5.4% of all Obstetrics admissions. Of 327 maternal deaths during this period, 153 deaths (46.8%) were due to complications of eclampsia. Of the 2351 eclampsia-related cases over the period, only 1523 case records were retrieved with complete records and analyzed. Table 1 shows the sociodemographic characteristics of the patients. The highest prevalence was among patients age range 15-19 years of age (37.3%) and 20-24 years of age (31.4%). The worse affected patients were dependents (63.4%), who were mostly nullipara (57.5%), with no formal education (76.5%) and were predominantly living in rural communities (86.9%). Table 2 shows the prevalence of eclampsia and case fatality during the study period (2011-2020). The prevalence of eclampsia was 3.5% with a case fatality of 10%. Table 3 shows the distribution of maternal deaths by delivery related characteristics. Majority of patients (94.1%) who died due to complications of eclampsia were never booked for antenatal care and antepartum eclampsia (71.2%) was the commonest type of eclampsia observed in this study.

Table 4 shows a Year-wise prevalence of Maternal death due to eclampsia in a 10-year review. It was observed that, the yearly

prevalence for the period under review was fairly similar. The cumulative prevalence (P) of eclampsia was 46.8%. Common complications of eclampsia causing maternal death (n=153) during the studied period were as shown in Table 5. Pulmonary oedema accounted for 47.1% (72) of all eclampsia related deaths with Cerebrovascular accident contributing 23.5% (36) and DIC, 17.0% (26).

Fig. 2. illustrates the trend of eclampsia-related deaths and maternal deaths from other causes,

demonstrating a modest decline in maternal mortality over a decade. While maternal deaths from eclampsia and other causes were nearly equal in 2011 (21 versus 20), the gap has widened by 2020, with maternal deaths from other causes surpassing those from eclampsia (10 versus 16).

Fig. 3 shows the distribution of the causes of maternal death due to eclampsia. The commonest cause of death from eclampsia was pulmonary oedema (47.1%).

Table 1. Sociodemographic characteristics of eclamptic patients who died during the study period (n=153)

Variables	Total no. of patients	Percentage %	Cumulative %
Age (years)			
15-19	57	37.3	37.3
20-24	48	31.4	68.7
25-29	29	19.0	87.7
30-34	13	8.4	96.1
≥35	6	3.9	100.0
Occupation			
Dependant	97	63.4	63.4
Farming	42	27.5	90.9
Business	11	7.2	98.1
Civil Servants	3	1.9	100.0
Parity			
0	88	57.5	57.5
1-4	53	34.7	92.2
≥5	12	7.8	100.0
Education Status			
No formal	117	76.5	76.5
Primary	20	13.1	89.6
Secondary	11	7.2	96.8
Tertiary	5	3.2	100.0
Place of residence			
Rural	133	86.9	86.9
Urban	20	13.1	100.0

Table 2. Prevalence of eclampsia and case fatality rate during the study period (2011-2020)

Year	Total Deliveries (n)	Total eclampsia	Eclampsia deaths	Prevalence of Eclampsia (%)	Case fatal (f) %
2011	5235	189	21	3.6	11.1
2012	5107	176	19	3.4	10.8
2013	4314	151	15	3.5	9.9
2014	5617	163	16	2.9	9.8
2015	3822	125	12	3.3	9.6
2016	3561	142	17	4.0	12.0
2017	5205	157	18	3.0	11.5
2018	4112	150	12	3.6	8.0
2019	3201	133	13	4.2	9.8
2020	3185	137	10	4.3	7.3
2011-2020	43359.0	1523.0	153.0	3.5	10.0

Table 3. Distribution of maternal deaths by delivery related characteristics (n=153)

Booking status	Total no. of patients	Percentage %	Cumulative %
Booked	9	5.9	5.9
Unbooked	144	94.1	100.0
Type of Eclampsia			
Antepartum	109	71.2	71.2
Intrapartum	9	5.9	77.1
Postpartum	35	22.9	100.0
Time interval (hours)			
0 – 12	110	71.9	71.9
13 – 24	30	19.6	91.5
> 24	13	8.5	100.0

Table 4. Year-wise Prevalence of Maternal death due to eclampsia a 10-year review (2011-2020)

Year	Maternal Deaths	Eclampsia deaths (P)	Contribution due to eclampsia (%)
2011	41	21	51.2
2012	36	19	52.8
2013	31	15	48.4
2014	33	16	48.5
2015	30	12	40.0
2016	37	17	45.9
2017	35	18	51.4
2018	29	12	41.4
2019	29	13	44.8
2020	26	10	38.5
2011-2020	327	153	46.8

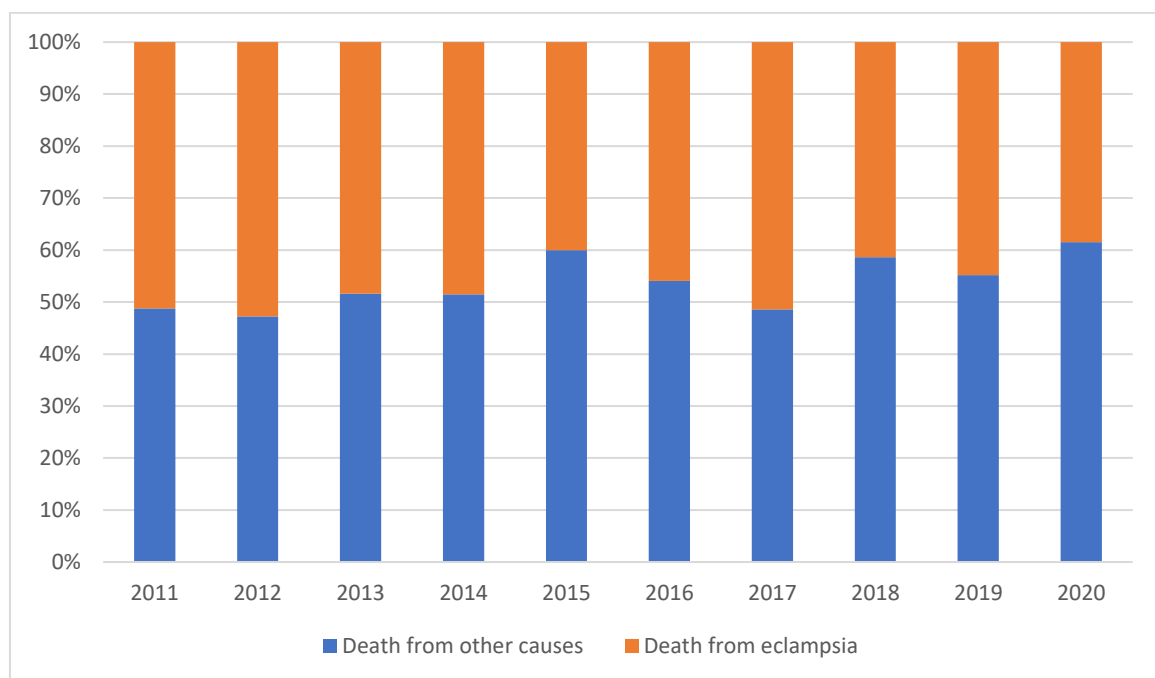


Fig. 1. The Contribution to maternal death due to eclampsia and other causes year by year (2011-2020)

Table 5. Common Complications of eclampsia Causing maternal death (n=153) during the study period

Year	Pul. Oedema	DIC	CVA	RF	HELLP	Others	Total
2011	8	5	3	2	1	2	21
2012	7	2	7	1	1	1	19
2013	7	4	2	2	0	0	15
2014	9	2	4	1	0	0	16
2015	6	2	3	1	0	0	12
2016	8	2	5	2	0	0	17
2017	10	4	3	1	0	0	18
ss2018	6	1	4	1	0	0	12
2019	4	3	4	2	0	0	13
2020	7	1	1	1	0	0	10
2011-2020	72(47.1%)	26(17.0%)	36(23.5%)	14(9.2%)	2(1.3%)	3(2.0%)	153(100%)

Foot notes; Pul. Oedema=Pulmonary Oedema, DIC= Disseminated intravascular Coagulopathy, CVA= Cerebrovascular accident
RF=Renal failure, HELLP=hemolysis, elevated liver enzyme, and low platelet count

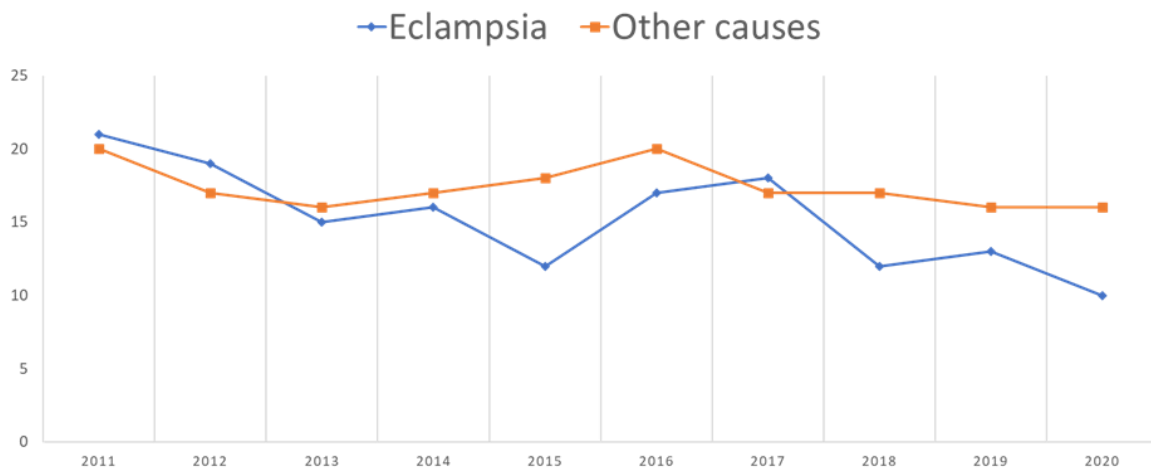


Fig. 2. Trend of eclampsia-related deaths and maternal deaths due to other causes (2011-2020)

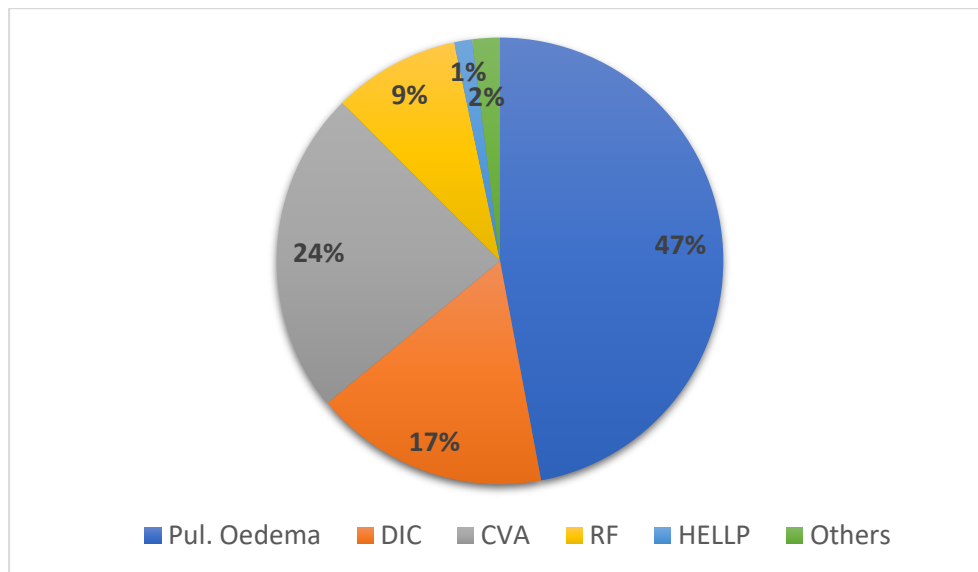


Fig. 3. Cause of maternal death due to eclampsia
Pul. Oedema=Pulmonary Oedema, DIC= Disseminated intravascular Coagulopathy
RF=Renal failure, HELLP=hemolysis, elevated liver enzyme, and low platelet count

4. DISCUSSION

Eclampsia continues to account for significant maternal and perinatal morbidity and mortality and remains a challenge especially in low- and middle-income countries of Sub-Saharan Africa [1-3]. This study highlights several preventable and practical issues that influence mortality in patients presenting with eclampsia at Federal Medical Centre (FMC), Makurdi, Benue State, North Central Nigerian tertiary hospital. The prevalence of eclampsia in this study was 3.5% which is comparable with rates reported by Ratan Das et al. (2.8%) in India, Kabiru et al in Lagos, Nigeria (2.8%), and Okogbenin et al in Irrua, southern Nigeria (2.52%) [4,6,12]. This was higher than the prevalence reported in the UK (0.027%) and Saudi Arabia (0.056%) [2,12]. In contrast, a study in Bangladesh reported a significantly higher rate of 9% [13].

The case fatality rate in this study was 10.0%, which is similar to the study in Gombe, North-east Nigeria where a case fatality rate of 11.6% was reported [13]. The rate was however higher than the United Nations recommendation of < 1% [14,15]. Countries such as the UK and Saudi Arabia, reported no maternal deaths from eclampsia in recent reports [7,16-18]. However, some studies reported a higher case fatality rates than ours include Olatunji et al in Sagamu in South-west Nigerian where a rate of 20% was reported [18] while Kullima et al in Nguru in North-east Nigeria reported a rate of 22.3% of case fatality [19]. The case fatality of eclampsia related complications reported by Nwobodo et al in Sokoto in North-west Nigeria was 37.1% which was extremely high compare to the finding in our study [20]. The disparity in the prevalence and case fatality of eclampsia among the various studies can be attributed to geographic and demographic differences and variations in healthcare systems. Maternal death rates from eclampsia are much lower in developed countries probably because of their well-developed healthcare systems [15-16].

In this study, women below 25 years of age (68.7%) and nullipara (57.5%) accounted for the majority of eclampsia-related maternal deaths. Also, those who were unemployed (63.4%), had no formal education (76.5%), resided in rural areas (86.9%), un-booked for antenatal care (94.1%), and had antepartum eclampsia (71.2%) contributed to a majority of the eclampsia-related deaths. These findings are corroborated with the findings in studies done by Kallumi et al in Nguru and Geidam et al in Maiduguri [19,21]. The high

proportion of younger patients in this study may be because of early marriage, early pregnancy and patients from rural communities and surrounding communities where most of the cases were referred from. Also, it may be due to social customs in which teenage pregnancy is a very common practice. Low socio-economic status and illiteracy are also important causes of early marriage and childbirth [4]. Furthermore, these factors may be connected to near absent availability of quality healthcare services in many locations observed in low income nations. Sometimes, procrastination in seeking medical attention, and insufficient knowledge regarding complications associated with pregnancy may be the major reason late presentation in the hospital.

The delays in seeking health care observed in this study, which was evident by the fact that 71.9% of the recorded deaths related to eclampsia in our study took place within 12 hours of initial presentation. Tukur et al in their review in Kano, Nigeria, found that delay before hospital presentation was significantly associated with mortality in eclamptic patients [22]. Hussain et al in Dhaka, Senegal, also reported that mortality was higher in eclamptic patients admitted 5 hours after the onset of seizures [23]. In Nigeria, superstition and traditional beliefs may also be the major reason for the delay in the transfer of women to health facilities. Many communities in developing nations due to high level of illiteracy, associate problems in pregnancy to witchcraft and supernatural. Therefore, such patients sometimes are first taken to the churches, faith healing centers, and the traditional healers, they only present to the hospital as a last resort when complications have already set in. Financial constraints may also be a reason for the delay in presenting to the hospital after referral. The role of the poor state of the roads, suboptimal transportation facilities, and non-availability of ambulance services contributes to late presentation to health facilities especially in sub-Saharan African nations.

Despite all the challenges, eclampsia-related maternal mortality showed a decent decline over the ten-year study period. However, overall, it remained the leading cause of maternal mortality in the institution accounting for 46.8% of the 327 maternal deaths in this current study. A study in Jos, North Central, Nigeria by Kahansim ML et al. reported the leading causes of maternal deaths were pre-eclampsia/eclampsia accounting for 30.0% of all deaths during the

study [10]. Also, recent reports from other institutions in the country also reported eclampsia as the leading cause of maternal deaths [6,8–10].

Multiple studies have established a connection between the occurrence of complications and mortality in patients with eclampsia [6-8,12]. Common complications associated with eclampsia in this study were pulmonary edema, cerebrovascular accident, disseminated intravascular coagulopathy, acute renal failure, and HELLP syndrome. Pulmonary edema (47.1%) was the leading cause of death in eclampsia, followed by cerebrovascular accidents (17%) in this study. A study by Geidam et al in Maiduguri made similar findings [21]. In our environment, lack of intensive care monitoring, and poor fluid therapy monitoring due to lack of central venous pressure monitoring and pulmonary capillary wedge pressure monitoring often leads to an increased risk of pulmonary oedema. Since pulmonary oedema and cerebrovascular accidents are well-documented complications of eclampsia and have been reported to be associated with mortality in these patients, it is therefore imperative that these complications are carefully searched for at presentation and when present, immediate treatment measures are instituted [18,21,23]. When these complications have not set in, immediate stabilization and prompt delivery are advised as delay in delivery may lead to complications and worsened prognosis [17-23].

5. CONCLUSION

The results of this study depicted a pitiful and gloomy picture of our society. Eclampsia contributes significantly to maternal mortality in our facility and Nigeria as a whole. Efforts should be made by all concerned to improve facilities and social infrastructures that will directly or otherwise minimize the occurrence of eclampsia. To reduce maternal mortality and morbidity, the main thrust should be on implementing basic and comprehensive emergency obstetric care. Most deaths can be avoided by improving socio-economic status, level of education, quality of patients' nutrition, good antenatal care, early referral, and quick and well-equipped transport facilities.

6. LIMITATIONS

It was a single-center, hospital-based, descriptive retrospective study. Therefore, selection bias

might have existed, and its capability of inferences was limited. Second, there were missing records and this could limit the ability of inferences. Third, Sample size was received by convenience and this may limit the ability of a definite conclusion. Lastly, follow-up analysis of inferential statistics on cause and effect was not performed.

7. RECOMMENDATION

To reduce maternal mortality and morbidity, the main thrust should be on implementing basic and comprehensive emergency obstetric care by the government and private owned facilities. Most deaths can be avoided by improving socio-economic status, level of education, quality of patients' nutrition, good antenatal care, early referral, and quick and well-equipped transport facilities. More studies are needed involving multicentered studies and robust methodology in order reduced or minimized the above limitations.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

CONSENT

It was not obtained since it was retrospective study

ETHICAL APPROVAL

Ethical approval for the study was obtained on 19th May, 2021 (FMR/FMC/MED:137/VOL.1/X) from Ethical Review Committee of Federal Medical Centre, Makurdi, Benue State, Nigeria.

ACKNOWLEDGEMENT

Sincere appreciation goes to the Management and Ethical review committee of Federal Medical Centre (FMC), Makurdi for the privilege and support to carry out this work. Special thanks to the Medical Records Department of the FMC, Makurdi for assisting with the records of clients.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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