

# Maternal Outcome of Severe Pre-eclampsia and Eclampsia Managed in the High Dependency and Intensive Care Units of the Delta State University Teaching Hospital, Oghara. South-South Nigeria

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## Abstract

**Introduction:** The maternal outcome of patients with severe pre-eclampsia and eclampsia managed at the high-dependency and intensive care units of the Delta State University Teaching Hospital, Oghara, has not been previously determined. This study aimed to do that.

**Methodology:** This was a retrospective descriptive study of patients who were admitted for severe pre-eclampsia and eclampsia in the high dependency unit (HDU) and the Intensive Care Unit (ICU), of the Delta State University Teaching Hospital (DELSUTH), Oghara, from January 1, 2017, to December 31, 2023. Data on socio-demographic, and clinical characteristics, were collected using a data proforma. The captured data was subsequently transferred to a computer-based dataset. Data analysis was by SPSS version 25 (IBM)

**Results:** The medical records of 85 out of 97 patients who were managed for severe pre-

eclampsia and eclampsia at the HDU/ICU of DELSUTH, Oghara, during the study period, were captured and analyzed. The fatality rate among patients was 10.3%. The prevalence rate of severe pre-eclampsia/eclampsia at the study facility was 9.3%. The majority (87%) of cases were early-onset pre-eclampsia/ eclampsia. Over 90% of the patients were referred from other health facilities. Pulmonary edema (n=5) was the leading cause of maternal death. Age of patients  $\leq 30$  years was associated with a better outcome (P-value = 0.03).

**Conclusion:** Our study found a high level of maternal death among patients with severe pre-eclampsia/ eclampsia, despite HDU/ ICU management, principally due to pulmonary edema

**Keywords:** Maternal Outcome, Severe pre-eclampsia, eclampsia, Intensive care unit, maternal fatality rate.

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## INTRODUCTION

Hypertensive disorders of pregnancy, particularly preeclampsia/eclampsia, remains one of the leading causes of maternal morbidity and mortality worldwide.<sup>1</sup> They complicate 10% of all pregnancies and are estimated to cause 40,000 maternal deaths worldwide each year.<sup>2</sup> Furthermore, women in less developed countries are at a higher risk of developing pre-eclampsia, compared to those in the more developed part of the world.<sup>1,3,4</sup>

Pre-eclampsia has been previously defined as the onset of hypertension accompanied by significant proteinuria after 20 weeks of gestation. Recently, the definition of Pre-eclampsia has been broadened.<sup>3</sup> The revised definition of pre-eclampsia according to the International Society for the Study of Hypertension in Pregnancy (ISSHP) is *de novo* hypertension after 20 weeks of gestation with one or more of proteinuria, maternal organ dysfunction (including renal, hepatic, hematological, or neurological features), or fetal growth restriction.<sup>2,3,5</sup>

Eclampsia, on the other hand, is defined as the occurrence of one or more generalized, tonic-clonic convulsions unrelated to other medical conditions in women with hypertensive disorders of pregnancy.<sup>6,7</sup> It is one of the most serious acute complications of pre-eclampsia necessitating High Dependency and Intensive Care Unit admissions. Others include preeclampsia with postpartum hemorrhage/DIC, HELLP syndrome, kidney failure, pulmonary edema, and heart failure.<sup>8</sup>

The pathogenesis of hypertensive disorders of pregnancy is not fully understood, but it is

thought that immune-genetic factors result in endothelial abnormalities.<sup>3</sup> These abnormalities are mediated by factors that include cytokines, lipid peroxidation and fragmented fibronectin. The abnormal endothelium results in widespread vasoconstriction. This is due to the failure of the endothelium to produce adequate prostacyclin and possibly nitric oxide, coupled with an increase in platelet-derived factors such as thromboxane and serotonin. The abnormal endothelium also causes acceleration of the procoagulant state of pregnancy.<sup>3,9</sup>

Nulliparity, prior preeclampsia, a family history of pre-eclampsia, and increased maternal age are all risk factors for the development of preeclampsia. Preexisting medical conditions such as hypertension, diabetes, renal illness, and antiphospholipid syndrome raise the maternal risk of preeclampsia.<sup>3,8</sup>

The need to establish a diagnosis and institute early management of an expectant or post-partum mother with pre-eclampsia, eclampsia, and HELLP syndrome is to reduce morbidity and mortality rates. Therefore, the management requires different disciplines, including Obstetricians, Anesthesiologists, and Intensivists.<sup>10</sup>

This study aimed to provide a review of the management and maternal outcome of women admitted for severe preeclampsia and eclampsia in the High Dependency Unit and Intensive Care Unit of the Delta State University Teaching Hospital (DELSUTH) Oghara, Delta State, South-South, Nigeria.

## MATERIALS AND METHODS

**Design:** This was a retrospective descriptive study of patients, in a census sampling method, who were admitted due to severe pre-eclampsia and eclampsia into the HDU and ICU of the Delta State University Teaching Hospital (DELSUTH), Oghara, from January 1, 2017, to December 31, 2023.

**Study setting:** The DELSUTH, Oghara, is one of the two State-owned tertiary Hospitals serving the Central and Southern Senatorial part of the State. The Department of Obstetrics and Gynaecology has a bed capacity of 24, with 15 Consultant Obstetrician and Gynecologist. It is a training center for resident doctors. Its services are out of pocket and has a low mean annual delivery rate of 150. The other tertiary health facility, located about 40 kilometers away from the study facility, is the Central Hospital Warri (CHW), with a delivery rate of 3,500 per year. Despite this high volume of patients, it lacks functional ICU. It offers free Maternity and free under-five services, through a contributory health insurance scheme of the State Government. The CHW has Five consultants in the Department of Obstetrics and Gynaecology. Training and clinical service collaboration exists between the two tertiary health centers. The patients with obstetric complications requiring ICU services are usually referred to DELSUTH, Oghara.

The Department of Obstetrics and Gynaecology of the study facility has an HDU, dedicated to the management of obstetric emergencies, including severe pre-eclampsia/eclampsia. There is also, a six-bed central ICU, which serves the entire hospital, as well as referrals from other health facilities

in Delta State. All cases of severe pre-eclampsia/ eclampsia are initially seen at the departmental triage for evaluation before transfer to the HDU/ICU.

**Patients Selection:** The medical records of patients who met the diagnostic criteria stated in the operational definition of severe pre-eclampsia/eclampsia, were selected for the study. Patients with seizures due to other causes were excluded.

**Operational Definitions:** Pre-eclampsia was considered severe if at least one of the following criteria were present; hypertension with severe proteinuria (2+, 3+, or 4+ on urine dipstick) or evidence of multiorgan impairment.<sup>11</sup>

Women with pre-eclampsia and subsequently developed seizures that could not be traced to any other cause were considered to have eclampsia.<sup>6,7</sup>

**Data collection tools and procedure:** The names and hospital number of the patients who were admitted due to hypertensive disorders in pregnancy at the departmental triage, HDU, and ICU were copied by the researchers from the admission notebooks. The medical records of the patients were retrieved from the record department by staff of the department. Only file-content that satisfied the selection criteria for severe pre-eclampsia/eclampsia were transferred to the study proforma, after subjecting them to content validity. The information on the proforma was transferred to a computer-based data sheet for analysis.

**Data quality and control:** All data proforma were examined by the researchers for completeness of information before transfer to computer data set.

**Data processing and Analysis:** The data set was cleaned up before analysis by SPSS version 25.0 (IBM Inc, Chicago, IL, USA). The data set was presented in frequencies and percentages. The statistical associations between categorical variables were subjected to Chi-square, and student's t-test. The statistical level of significance was set at a p-value of < 0.05.

**Ethical considerations:** The study approval was obtained from the DELSUTH, Health Research and Ethic Committee, with approval Id: HREC/PAN/203/035/0560.

## Results

A total of 97 patients were admitted into the HDU/ICU with severe pre-eclampsia/eclampsia during the study period, and the total live birth was 1038, resulting in the prevalence rate of 9.3% for severe pre-eclampsia/eclampsia in the study facility. Eighty-five (87.6%) medical records of the eligible subjects were available for analysis. Nine of the data proformas contained insufficient information for inclusion in the computer-based data set, while the remaining 3 were missing.

There were 29 maternal deaths during the study period, with a maternal mortality ratio of 2,794 per 100,000 live births. Severe pre-eclampsia/ eclampsia accounted for 10(34.5%) of the deaths. The fatality rate among the subjects was 10.3%.

The sociodemographic and reproductive characteristics of subjects are shown in Table 1: The majority (88.2%) of the patients were over 20 years old. Over 90% were married, and over 2/3 (66.2%) had at least secondary level education. Christianity is the dominant religion in the southern part of Nigeria. Buying and selling is a common occupation in Delta State. This was shown in the study, with trading accounting for 37.7% of the occupation among the subjects. The location of the study facility and many of the referring health facilities are dominantly (55.6%) populated by the Urhobo ethnic group. Nulliparity accounted for the highest (27.2%) number of subjects, which is consistent with one of the risk factors for the development of pre-eclampsia/eclampsia.

Table 1: Socio-demographic and reproductive characteristics of subjects

| Variable                   | Frequency | Percentage |
|----------------------------|-----------|------------|
| Age (in years) (n = 85)    |           |            |
| ≤ 20                       | 10        | 11.8       |
| 21 – 30                    | 35        | 41.2       |
| 31 – 40                    | 34        | 40.0       |
| ≥ 41                       | 6         | 7.0        |
| Marital status (n = 85)    |           |            |
| Single                     | 6         | 7.1        |
| Married                    | 72        | 84.7       |
| Cohabiting                 | 7         | 8.2        |
| Educational level (n = 77) |           |            |
| No formal education        | 1         | 1.3        |
| Primary                    | 7         | 9.1        |
| Secondary                  | 51        | 66.2       |

|                     |    |       |
|---------------------|----|-------|
| Tertiary            | 18 | 23.4  |
| Religion (n = 85)   |    |       |
| Christianity        | 85 | 100.0 |
| Occupation (n = 77) |    |       |
| Unemployed          | 11 | 14.3  |
| Student             | 12 | 15.6  |
| Artisan             | 17 | 22.1  |
| Trader              | 29 | 37.7  |
| Famer               | 3  | 3.9   |
| Public servant      | 5  | 6.5   |
| Tribe (n = 81)      |    |       |
| Urhobo              | 45 | 55.6  |
| Igbo                | 15 | 18.5  |
| Isoko               | 8  | 9.9   |
| Itsekiri            | 3  | 3.7   |
| Yoruba              | 2  | 2.5   |
| Ijaw                | 2  | 2.5   |
| Edo                 | 4  | 4.9   |
| Akwa Ibom           | 1  | 1.2   |
| Ibibio              | 1  | 1.2   |
| Parity (n = 81)     |    |       |
| 0                   | 22 | 27.2  |
| 1                   | 19 | 23.5  |
| 2                   | 16 | 19.8  |
| 3                   | 8  | 10    |
| 4                   | 10 | 12.3  |
| ≥4                  | 6  | 7.0   |

The clinical characteristics of the patients in the study are highlighted in Table 2: The majority (55.3%) of subjects were booked outside the study facility, over 2/3 (69.4%) were referred from secondary public health facilities located in the state. The paucity of HDU/ ICU services, as well as lack of multidisciplinary health professionals required in the management of severe pre-eclampsia/ eclampsia were responsible for the referrals. The shortage of specialist health professionals was compounded in recent years in Nigeria by emigration of such health personnel to different part of the world for

better living conditions, a situation described as “Japa” in local parlance, which means, ‘to run away.’

Sixty-one (80.2%) subjects had eclamptic fits, and majority (60.5%) were antepartum eclampsia. Early onset pre-eclampsia occurred in 87.0% of the patients. About 2/3 (67.6%) of the subjects were delivered by caesarean section. This was consistent with management policy of severe pre-eclampsia/eclampsia, which involved stabilization and delivery of mother by the most expeditious route. More than half

(58.5%) of the patients had 1-6 eclamptic fits before presentation, 39.7% (31/78) patients were given MgSO<sub>4</sub> at the referring facility before presentation. Magnesium Sulphate is widely used in most health facilities in Delta State for both prevention, and control seizures in severe pre-eclampsia and eclampsia. Over 40% (26/58) of the subjects who had eclamptic fits before presentation were admitted into ICU after an hour. The reasons for the delay included: lack of bedspace (15.4%), and lack of money (50.0%). It is worth nothing that in situations in which a patients could not afford the ICU deposit; the managing consultant was expected to interphase with hospital

management and act as a guarantor for bill settlement in order to ensure that the patients were accorded needed emergency services. The most common reasons for ICU/HDU admission were repeated seizures (28.2%), Coma (23.5%), pulmonary oedema (14.1%), and renal failure with elevated BUN requiring dialysis (15.3%). Eighteen (40.0%) subjects stayed in ICU for an average of 3 – 4 days. Following discharge from ICU, subjects were transferred to HDU and subsequently to post-natal ward before being finally discharged home. Twenty-three (31.5%) of the patients had co-morbid conditions which included, chronic hypertension (82.6%), and diabetes mellitus (4.3%).

Table 2: Clinical Parameters of subjects with severe pre-eclampsia/eclampsia

| Clinical parameter.                                            | Frequency | Percentage |
|----------------------------------------------------------------|-----------|------------|
| Booking status                                                 |           |            |
| Booked                                                         | 47        | 55.3       |
| Un-booked                                                      | 36        | 42.4       |
| Not indicated                                                  | 2         | 2.4        |
| Referral Status                                                |           |            |
| DELSUTH patient                                                | 7         | 8.3        |
| Private hospital                                               | 15        | 17.6       |
| Public health facility                                         | 59        | 69.4       |
| Home                                                           | 4         | 4.7        |
| Timing of Eclampsia (n = 76)                                   |           |            |
| No seizure (severe pre-eclampsia)                              | 15        | 19.7       |
| Antepartum                                                     | 46        | 60.5       |
| Postpartum                                                     | 15        | 19.7       |
| Gestational age at admission for antepartum eclampsia (n = 46) |           |            |
| <24                                                            | 5         | 10.9       |
| 24 – 28                                                        | 21        | 45.7       |
| >28 – 32                                                       | 14        | 30.4       |
| > 32                                                           | 6         | 13.0       |
| Mode of delivery (n = 71)                                      |           |            |
| Spontaneous vaginal delivery                                   | 23        | 32.4       |
| Caesarean section                                              | 48        | 67.6       |
| Eclamptic fit before presentation (n = 82)                     |           |            |
| Yes                                                            | 48        | 58.5       |
| No                                                             | 34        | 41.5       |

|                                                                        |    |      |
|------------------------------------------------------------------------|----|------|
| If yes, number of times (n = 48)                                       |    |      |
| 1 – 2                                                                  | 29 | 60.5 |
| 3 – 4                                                                  | 13 | 27.0 |
| 5 – 6                                                                  | 6  | 12.5 |
| Administration of MgSO <sub>4</sub> before arrival in DELSUTH (n = 78) |    |      |
| Yes                                                                    | 31 | 39.7 |
| No                                                                     | 47 | 61.3 |
| Time interval between presentation and ICU admission (n = 58)          |    |      |
| < 1 hour                                                               | 32 | 55.2 |
| > 1 hour                                                               | 26 | 44.8 |
| Reasons for delay into ICU admission (n = 26)                          |    |      |
| Lack of bedspace                                                       | 4  | 15.4 |
| Difficulty in making payment                                           | 13 | 50.0 |
| Deteriorating state after initial review                               | 3  | 11.5 |
| No specific reason indicated                                           | 6  | 23.1 |
| Indications for HDU/ ICU admission (n = 85)                            |    |      |
| Repeated seizures                                                      | 24 | 28.2 |
| Coma                                                                   | 20 | 23.5 |
| Pulmonary oedema                                                       | 12 | 14.1 |
| Renal failure with elevated BUN requiring dialysis                     | 13 | 15.3 |
| Restlessness of the patient                                            | 9  | 10.6 |
| CVA with neurologic deficit                                            | 7  | 8.2  |
| Duration of ICU admission (in days) (n = 45)                           |    |      |
| 1 – 2                                                                  | 13 | 28.9 |
| 3 – 4                                                                  | 18 | 40.0 |
| 5 – 6                                                                  | 10 | 22.2 |
| ≥ 7                                                                    | 4  | 8.9  |
| Co-morbidity (n = 73)                                                  |    |      |
| Yes                                                                    | 23 | 31.5 |
| No                                                                     | 50 | 68.5 |
| Co-morbid conditions (n = 23)                                          |    |      |
| Chronic hypertension                                                   | 19 | 82.6 |
| Diabetes mellitus                                                      | 1  | 4.3  |
| Peptic ulcer                                                           | 1  | 4.3  |
| Anemia                                                                 | 1  | 4.3  |
| Chronic kidney disease                                                 | 1  | 4.3  |

Shown in Figure 1 is the outcome of patients with severe pre-eclampsia/ eclampsia who were admitted into the ICU of DELSUTH, Oghara. Information for only 71 patients was provided for analysis; 49 (69.0%) were discharged to the post-natal ward fully conscious. The fatality rate was 10/97

(11.5%), 9 (12.7%) were discharged to HDU with oxygen support, and 2 (2.8%) patients were referred to a tertiary health facility in another state in Nigeria. The reasons for the mortalities included, Pulmonary edema (5), renal failure (3), and CVA (2). All the mortalities were referrals that presented late

at the facility. The 3 patients who died from complications of renal failure received

between 2 to 5 sessions of hemodialysis, before they died.

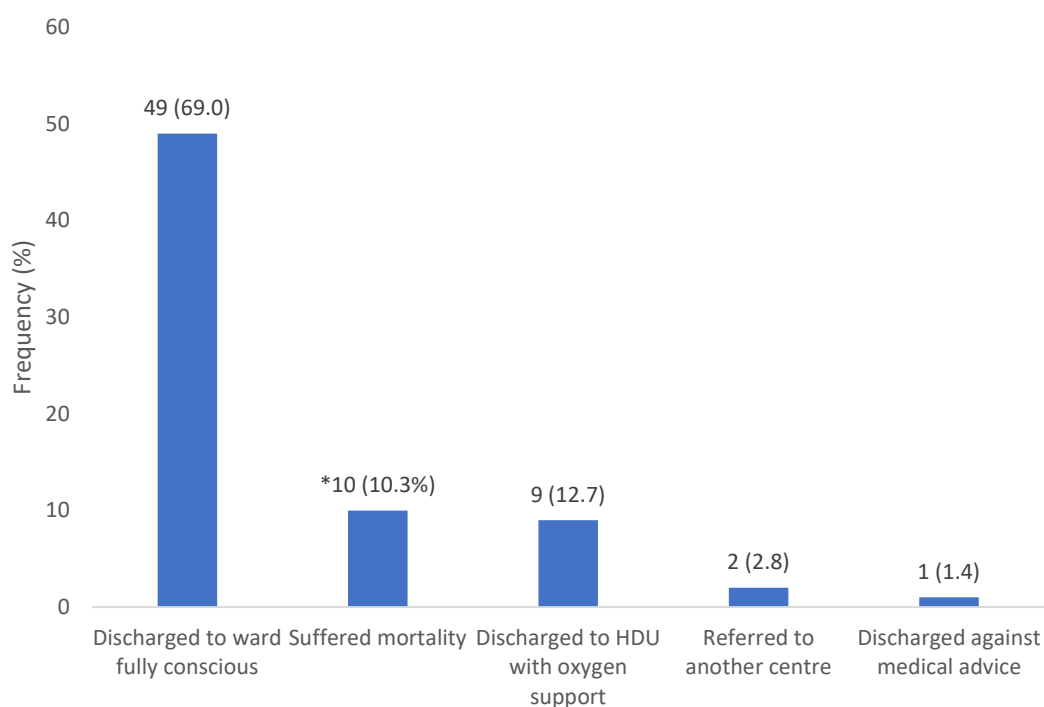


Figure 1: Outcome of patients with severe pre-eclampsia/ eclampsia (n=71)

\*Fatality rate = 10.3%

Table 3 showed the association between sociodemographic characteristic and maternal outcome. The age of patients was the only significant socio-demographic

characteristic that affected maternal outcome. A higher proportion of patients who were 30 years and below, survived, when compared to the other age categories.

Table 3: Socio-demographic factors associated with patients' outcomes

| Variable                | Patient outcome |           | $\chi^2$            | p-value |
|-------------------------|-----------------|-----------|---------------------|---------|
|                         | Survived        | Died      |                     |         |
| Age (n = 71)            |                 |           |                     |         |
| 20 and below            | 10 (100.0)      | 0 (0.0)   | Fisher's exact test | 0.030   |
| 21 – 30                 | 29 (90.6)       | 3 (9.4)   |                     |         |
| 31 – 40                 | 20 (83.3)       | 4 (16.7)  |                     |         |
| > 41                    | 2 (40.0)        | 3 (60.0)  |                     |         |
| Marital status (n = 71) |                 |           |                     |         |
| Single                  | 3 (60.0)        | 2 (40.0)  | Fisher's exact test | 0.172   |
| Married                 | 52 (86.7)       | 8 (13.3)  |                     |         |
| Cohabiting              | 6 (100.0)       | 0 (0.0)   |                     |         |
| Education (n = 66)      |                 |           |                     |         |
| No formal education     | 0 (0.0)         | 1 (100.0) | Fisher's exact test | 0.256   |
| Primary                 | 6 (85.7)        | 1 (14.3)  |                     |         |
| Secondary               | 37 (84.1)       | 7 (15.9)  |                     |         |
| Tertiary                | 13 (92.9)       | 1 (7.1)   |                     |         |
| Occupation (n = 66)     |                 |           |                     |         |
| Unemployed              | 7 (77.8)        | 2 (22.2)  | Fisher's exact test | 0.057   |
| Student                 | 12 (100.0)      | 0 (0.0)   |                     |         |
| Artisan                 | 16 (100.0)      | 0 (0.0)   |                     |         |
| Trader                  | 16 (72.7)       | 6 (27.3)  |                     |         |
| Farmer                  | 3 (100.0)       | 0 (0.0)   |                     |         |
| Public servant          | 3 (75.0)        | 1 (25.0)  |                     |         |
| Tribe (n = 69)          |                 |           |                     |         |
| Urhobo                  | 30 (83.3)       | 6 (16.7)  | Fisher's exact test | 0.192   |
| Itshekiri               | 1 (33.3)        | 2 (66.7)  |                     |         |
| Yoruba                  | 2 (100.0)       | 0 (0.0)   |                     |         |
| Igbo                    | 14 (100.0)      | 0 (0.0)   |                     |         |
| Ijaw                    | 1 (100.0)       | 0 (0.0)   |                     |         |
| Edo                     | 3 (100.0)       | 0 (0.0)   |                     |         |
| Isoko                   | 6 (75.0)        | 2 (25.0)  |                     |         |
| Akwa Ibom               | 1 (100.0)       | 0 (0.0)   |                     |         |
| Ibibio                  | 1 (100.0)       | 0 (0.0)   |                     |         |
| Parity (n = 67)         |                 |           |                     |         |
| Nulliparity             | 18 (90.0)       | 2 (10.0)  | Fisher's exact test | 0.159   |
| 1 – 2                   | 26 (92.9)       | 2 (7.1)   |                     |         |
| 3 – 4                   | 11 (78.6)       | 3 (21.4)  |                     |         |
| 5 – 6                   | 3 (60.0)        | 2 (40.0)  |                     |         |

Table 4 showed that there was no significant association between patients' clinical characteristics and outcome of patients managed for severe pre-eclampsia/eclampsia.

Table 4: Association between Clinical characteristics of patients and patient's outcome

| Variable                                                                 | Patient outcome |           | $\chi^2$            | <i>p</i> -value |
|--------------------------------------------------------------------------|-----------------|-----------|---------------------|-----------------|
|                                                                          | Survived        | Died      |                     |                 |
| Booking status (n = 70)                                                  |                 |           |                     |                 |
| Booked                                                                   | 33 (89.2)       | 4 (10.8)  | Fisher's exact test | 0.190           |
| Un-booked                                                                | 28 (87.5)       | 4 (12.5)  |                     |                 |
| Not indicated                                                            | 0 (0.0)         | 1 (100.0) |                     |                 |
| Referral Status (n = 70)                                                 |                 |           |                     |                 |
| DELSUTH patient                                                          | 4 (80.0)        | 1 (20.0)  | Fisher's exact test | 0.427           |
| Private hospital                                                         | 10 (83.3)       | 2 (16.7)  |                     |                 |
| Public health facility                                                   | 44 (88.0)       | 6 (12.0)  |                     |                 |
| Home                                                                     | 2 (66.7)        | 1 (33.3)  |                     |                 |
| Mode of delivery (n = 60)                                                |                 |           |                     |                 |
| Spontaneous vaginal delivery                                             | 16 (80.0)       | 4 (20.0)  | 0.240               | 0.624           |
| Caesarean section                                                        | 34 (85.0)       | 6 (15.0)  |                     |                 |
| Administered MgSO <sub>4</sub> (n = 64)                                  |                 |           |                     |                 |
| Yes                                                                      | 20 (80.0)       | 5 (20.0)  | Fisher's exact test | 0.245           |
| No                                                                       | 36 (92.3)       | 3 (7.7)   |                     |                 |
| Eclamptic fit before presentation                                        |                 |           |                     |                 |
| Yes                                                                      | 39 (90.7)       | 4 (9.3)   | 2.481               | 0.115           |
| No                                                                       | 20 (76.9)       | 6 (23.1)  |                     |                 |
| Time interval between presentation in DELSUTH and ICU admission (n = 57) |                 |           |                     |                 |
| < 1 hour                                                                 | 23 (74.2)       | 8 (25.8)  | 3.207               | 0.073           |
| > 1 hour                                                                 | 24 (92.3)       | 2 (7.7)   |                     |                 |
| Co-morbidity (n = 68)                                                    |                 |           |                     |                 |
| Yes                                                                      | 18 (78.3)       | 5 (21.7)  | 1.371               | 0.242           |
| No                                                                       | 40 (88.9)       | 5 (11.1)  |                     |                 |

## DISCUSSION

There was a fatality rate of 10.3 % among patients. Severe pre-eclampsia/eclampsia accounted for 34.5% (10/29) of maternal deaths at the tertiary health facility during the study period. The prevalence rate of severe pre-eclampsia/eclampsia at the study facility was 9.3%. A large proportion (87%) of cases were early-onset pre-eclampsia/eclampsia, and the majority

(69.4%) were referrals from public health facilities in the state. Pulmonary edema, Renal failure and CVA were the leading causes of death among the patients.

A high level of maternal death was demonstrated in this study among patients with severe pre-eclampsia/ eclampsia, despite HDU/ ICU management.

A ten-year descriptive review of patients with eclampsia conducted about two decades earlier in a missionary health facility in the state documented a fatality rate of 15.4%.<sup>12</sup> This rate was higher than the rate in this study. Some explanations for the higher rate of maternal death in the earlier study included the absence of ICU service, higher patient volume with fewer specialist staff, and poorer clinical state of patients due to delays at presentation. In a more recent retrospective study that was carried out in another tertiary health institution in Nigeria that involved 52 patients with preeclampsia/eclampsia managed in the ICU, there was a higher fatality rate (32.7%),<sup>1</sup> mainly from pulmonary edema. A fatality rate of 6.9%,<sup>13</sup> was reported among women who had eclampsia in a study carried out in Sub-Saharan Africa, Haiti, and India. A pilot study on the burden of hypertensive disorders in the West African Country of Liberia, however, reported a fatality rate of 12.3%,<sup>4</sup> among the study population. The different fatality rates reported in studies reflected the heterogeneity of study context, in terms of the health-seeking behaviors of the population, quality of health services, study designs, and delays in presentation at health facilities.

Reports,<sup>14</sup> from England and Wales, showed that the largest reductions in maternal deaths from pre-eclampsia/eclampsia were achieved with improved surveillance, diagnosis, and timely delivery, with further benefit from fluid restriction protocols and increased use of anti-convulsant therapies. While the study facility implemented strict fluid protocol and administration of Magnesium sulphate protocols in the management of pre-eclampsia/ eclampsia,

there was still a need for improved surveillance, early diagnosis of the disorder in the various referring health facilities in the state, provision of HDU/ICU, in addition to the employment of relevant specialists for the management of complications of severe pre-eclampsia/ eclampsia by the state government.

The incidence of early onset pre-eclampsia /eclampsia in this study was higher than the 78.3% reported by Ebeigbe and Aziken,<sup>15</sup> in their study in Benin City. The high incidence in this study seemed to support the suggestion by Onah and Iloabache in their study conducted over two decades ago that the incidence of early onset pre-eclampsia may be on the increase in Nigeria.<sup>16</sup> In a study by Teka, et al.,<sup>17</sup> it was observed that early onset disease was significantly associated with unfavorable maternal outcome, a suggestion that was consistent with the high fatality rate in our study.

Most patients in this study were referred from public health facilities in Delta State. This finding was similar to the 86.2% of unbooked patients reported by Igberase and Ebeigbe in their study.<sup>12</sup> The need for HDU/ICU management of severe cases of pre-eclampsia/ eclampsia, in addition to specialist care in complicated cases, was responsible for the high volume of referrals. While the State government has prioritized the spread of primary and secondary healthcare facilities, under the contributory health insurance policy, the requisite staffing and equipment of such facilities have been a major challenge. The study facility was the only State-owned hospital in the central and southern senatorial zones of Delta State with a functional ICU. Critical care of patients with

hypertensive disorders of pregnancy complicated by preeclampsia is advised.<sup>18</sup> This is because the disorder is multisystemic, requiring multidisciplinary care. Ventilatory support and close monitoring of the patient were the major indications for ICU admission in this study.

The leading contribution of pulmonary edema to maternal death in pre-eclampsia/eclampsia was shown in this study. The complication of pulmonary edema alone or with other complications of the disorder was a risk factor for poor outcome.<sup>12</sup> Pulmonary edema is a common complication of pre-eclampsia, and many factors have been implicated. This includes endothelial damage with resultant fluid leakage.<sup>19,20</sup> A study revealed that the incidence of pulmonary edema in pregnant women who received intravenous infusion of crystalloids was higher.<sup>21</sup> The majority of the patients in this study were referred from public health facilities lacking ICU care, while the types of intravenous fluid administered to them were not documented, it was not unlikely that some of them would have had suboptimal fluid management, and this may have contributed to the development of pulmonary edema, as a result of iatrogenic fluid overload.

The limitations in this study included the institutional setting, which made generalization of findings difficult, the retrospective design with obvious difficulties, such as incomplete medical records or missing information; to mitigate this challenge, the medical records were subjected to multiple reviews and data clean-up.

## Conclusion

Our study found a high level of maternal death among patients with severe pre-eclampsia/ eclampsia, despite HDU/ ICU management, principally due to pulmonary edema. Early identification and referrals of severe pre-eclampsia/eclampsia by various health facilities in Delta State will improve the outcome of patients. The provision of more ICUs and HDUs in other health facilities, including the requisite staffing of such facilities in the state, will mitigate the burden of referrals on the teaching Hospital at Oghara, Delta State.

A multi-center prospective study to examine the burden of severe pre-eclampsia and eclampsia in Delta State is also recommended

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