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Maternal outcome in eclampsia at Harare Maternity Hospital

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Abstract

***Objectives*:** To study the presentation, management and determinants of maternal outcome in eclampsia at Harare Maternity Hospital (HMH) in order to design interventions for reduction of maternal mortality.
Design: Cross sectional descriptive study.
Setting: Harare Maternity Hospital, Harare, Zimbabwe
Subjects: All women with diagnosis of eclampsia treated at HMH during an 18 month period.
Main Outcome Measures: The study variables included age, parity, booking status, gestational age, location at time of first seizure, number of fits, seizure to delivery interval, maternal complications and the clinical management.
Results: There were 151 women with eclampsia from 25 425 deliveries in HMH (5.9 per 1 000 deliveries). The case fatality was 26.5%. The majority of fits (67.5%) occurred *antepartum.* The mothers who died were significantly older than the survivors, mean age 25.8 versus 22.3 (p=0.007), and had a higher proportion of multiple seizures, 0.67 versus 0.39 (p=0.009). In 38% of cases the first seizure occurred at home. The proportion of complications was higher among those who died. Deficiencies in clinical management were more common in the women who died, 39.5% versus 20.9% for survivors (OR 2.55; 95% CI 1.09 to 5.99) and they included delays in achieving delivery, inadequate clinical assessment and poor monitoring.
Conclusion: Eclampsia remains a significant cause of maternal mortality in HMH with a high case fatality rate. Advanced maternal age, *antepartum* onset of convulsions and multiple fits were associated with increased risk of maternal death. There were deficiencies in the clinical management of a high proportion of cases.

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Introduction

Sub-Saharan Africa has one of the world's highest maternal mortality ratios, estimated at 870/100 000 live births.[1] Maternal mortality for the Greater Harare Maternity Unit (GHMU) was 370/100 000 live births in 1997 and eclampsia was responsible for 24.2% of maternal deaths.[2] In the Greater Harare Maternity Unit (GHMU) the proportion of maternal deaths due to eclampsia has ranged between eight and 24% (Figure I).

The proportion of maternal deaths due to eclampsia in similar settings ranges between 14 and 39%.[3,4] Case fatality for eclampsia varies widely.[3,5-9] There is need to reduce maternal mortality and interventions to achieve this reduction need to identify preventable causes of maternal death. Eclampsia is one such cause where case fatality can be reduced.

We conducted a contemporaneous review of all clinical notes of women with a diagnosis of eclampsia managed in HMH from January 1997 to June 1998 with the purpose of

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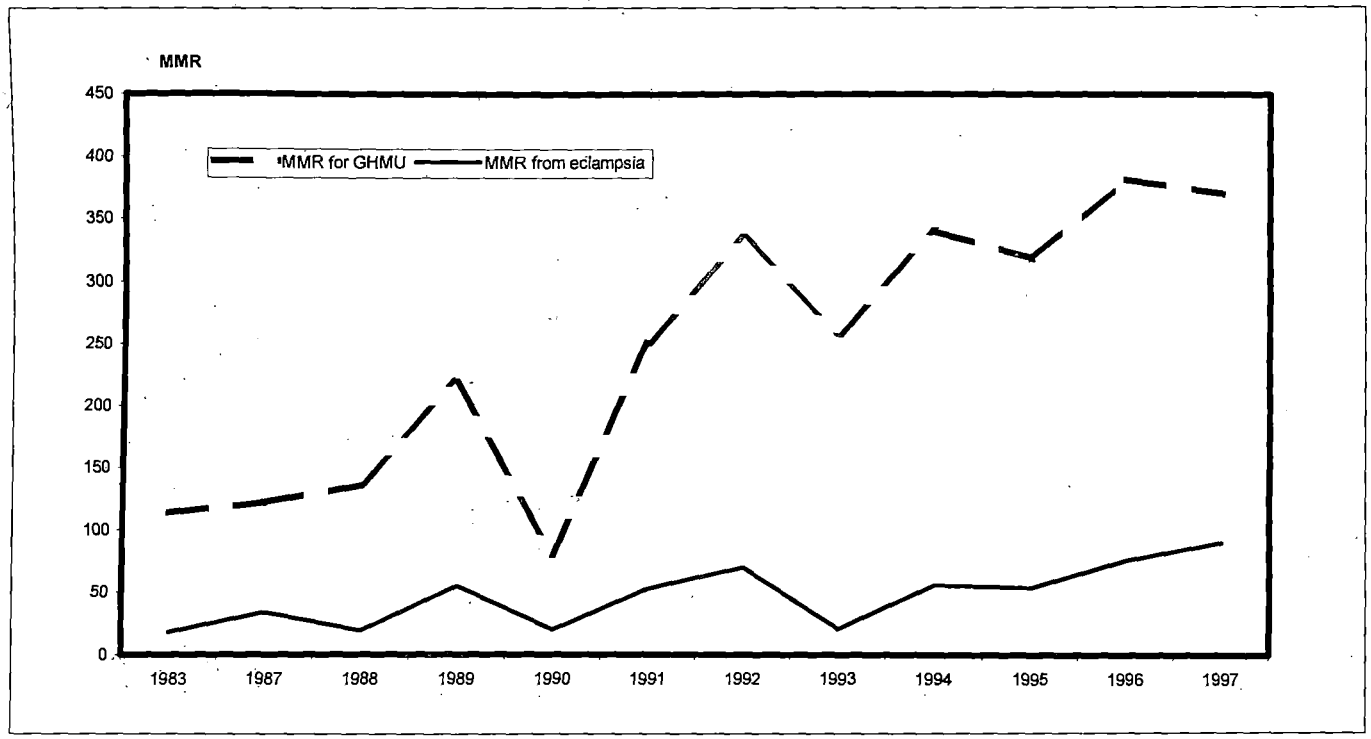
Figure I: Contribution of eclampsia to maternal mortality in the GHMU, 1983 to 1997.



identifying factors which adversely affected maternal outcome. Identification of risk factors for maternal death in eclamptic women was an essential step in the process of designing intervention strategies for reduction of maternal deaths from this preventable cause.

Materials and Methods

This was a cross sectional study of women with eclampsia in a tertiary hospital of a developing country. The GHMU is made up of a tertiary referral centre, HMH and 13 midwife-run municipal clinics that offer first level obstetric services. Apart from patients referred from the midwife-run urban clinics, HMH acts as a referral centre for all district and provincial hospitals in the northern half of Zimbabwe. All patients with eclampsia in the GHMU were referred to HMH. Patients with a diagnosis of eclampsia were admitted to a high care area located on the labour ward. Guidelines for the management of eclampsia in the hospital include:

1. Control of convulsions by an intravenous bolus of diazepam 10 mg.
2. Prevention of further fits by either the magnesium sulphate regime as described by Crowther [10] or an intravenous infusion of diazepam 80mg in one litre of 5% dextrose.
3. Control of hypertension by boluses of dihydrallazine to maintain diastolic blood pressure below 110mm Hg.
4. Delivery by the quickest safe route.

All women admitted with a diagnosis of eclampsia and those who developed eclampsia after admission to HMH were included in the analysis. A register was kept on the labour ward in which cases of eclampsia were recorded. The cases were identified daily by CM and all the clinical notes were reviewed by FM.

Epi Info 6 was used for data handling. Women who survived eclampsia were considered referents and those who died were the cases. Risks were analysed as odds ratio (OR) with 95% confidence intervals (CI) and p value <0.05 was considered significant. The study variables included age, parity, booking status, gestational age, timing of seizure, location at first seizure, number of fits, seizure to delivery interval, admission to the intensive care unit (ICU), complications and maternal outcome. An assessment of the clinical management of the woman was made without blinding for maternal outcome. Avoidable factors were identified and were assigned a level of avoidability i.e. patient factors, factors at referring unit and those at the central unit.

Results

There were 151 women with a diagnosis of eclampsia attended to during the 18 month period, 37 (24.5%) of whom experienced the first convulsion after admission to HMH. There were 25 425 deliveries in the hospital during this period and the incidence of eclampsia at HMH was therefore 5.9/1 000 deliveries. Ninety one women (60.3%) with eclampsia were referred from outside the GHMU. The GHMU, however, had 56 500 deliveries in the same period. There were 40 deaths among the eclamptic women thus giving a case fatality of 26.5%.

Table I: Age distribution (%) of eclampsia patients compared to the general GHMU patients.

Age group	Eclampsia	GHMU obstetrics population
≤15	2.6	1.0
16-19	33.1	20.3
25-29	16.6	22.9
30-34	7.9	10.2
≥35	7.9	7.7

The age distribution of the women with eclampsia and of the general obstetric population are as shown in Table I. There was no difference in mean age between the women with eclampsia and the general obstetric population, 23.2 (S.D. 6.2) and 24.4 (S.D. 5.9) years respectively.

The median parity and inter-quartile range for the unit was one (0; 2) and that for the women with eclampsia was zero (0; 1).

The women with eclampsia were, therefore, similar to the general obstetric population served by Harare Maternity Hospital in terms of age and parity.

The mortality for eclampsia increased with maternal age and the Chi-square test for trend was 7.295, p=0.006. Figure II shows the trend of increasing maternal mortality with maternal age.

The women who died were significantly older, mean age 25.8 versus 22.3 (p=0.007) and of higher parity, median one (0; 2) versus zero (0;1) (p=0.02) than those who survived. There was a high rate (28.4%) of unbooked mothers among the women who developed eclampsia. The rate of unbooked women for the unit during this period was 14%.[11] There was no difference in mean gestational age at onset of eclampsia for the women who survived and those who died; 34.8 (S.D.4.6) and 33.8 (S.D.5.0) weeks respectively.

Table II: Effect of demographic factors on maternal outcome. Odds ratio (OR) with 95% confidence intervals (CI) using survivors as referents or p value.

Characteristic	Survivors	Dead	OR(95%CI) or p value
Mean age(SD)	22.3(5.6)	25.8(7.3)	p=0.006
Median parity (q1;q3)	0(0;1)	1(0;2)	p=0.02
Gestation age (week)			
≥37	45	11	1
≤27	4	4	4.09 (0.64-25.2)
28-36	45	20	1.82 (0.73-4.61)
Not stated	17	5	
Booked	79	30	1
Unbooked	32	10	0.82 (0.33-2.01)
Timing of convulsion (%)			
Antepartum	69	35	4.82 (1.05-44.6)
Intrapartum	19	2	1
Postpartum	23	3	1.24 (0.13-16.2)
Location at first seizure (%)			
HMH	27	10	1
Home	49	17	0.94 (0.34-2.57)
Local clinic	35	13	1.00(0.34-2.93)

'SD Standard deviation.

The majority of seizures, 102 (67.5%), occurred *antepartum* and mortality was higher for women who developed *antepartum* eclampsia, (OR 4.82; 95%CI 1.05 to 44.60).

In 57 women (38.3%) the first convulsion occurred at home. There was no difference in maternal outcome for women who experienced the first convulsion at home compared to those whose first convulsion was in HMH (OR 0.94; 95% CI 0.34 to 2.57).

Figure II: Relationship betwen maternal age and mortality.

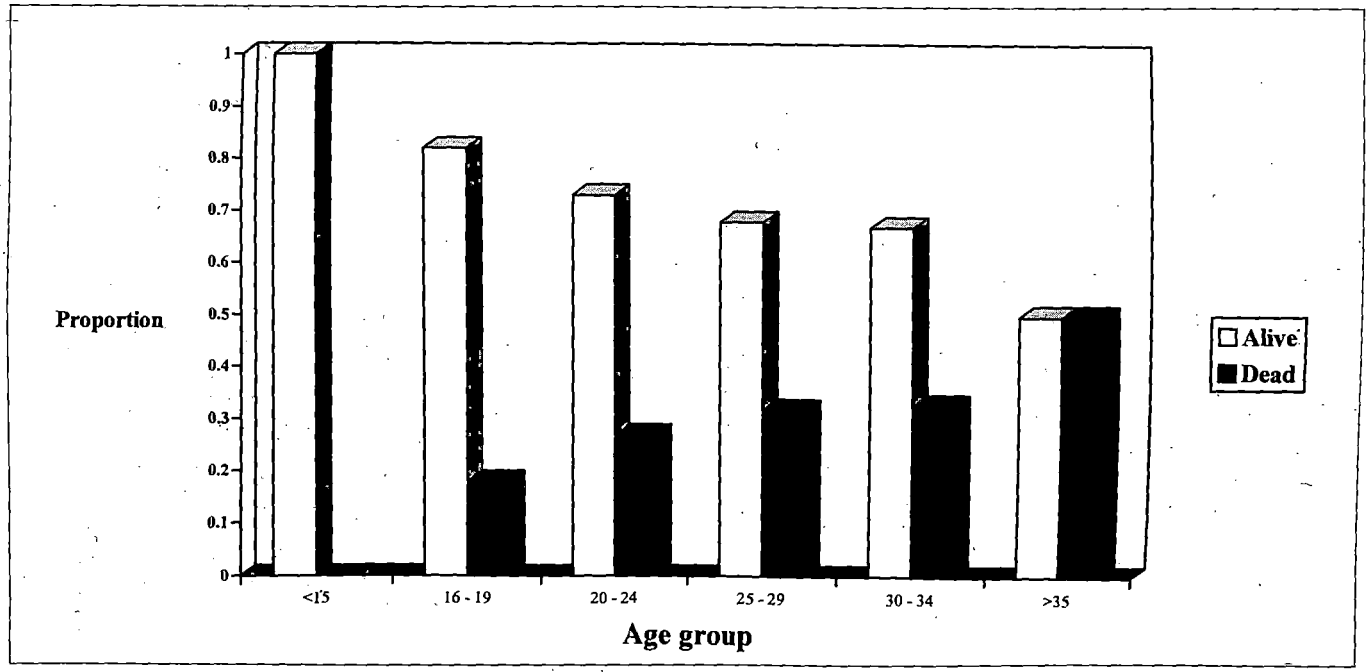


Table III: Effect of the severity of clinical condition on mortality. Odds ratio with 95% confidence intervals (CI) using survivors as referents.

Factor	Survivors	Dead	OR (95% CI)
Total number of convulsions			
1	36	7	1
2	14	3	1.10 (0.19-5.81)
≥3	24	13	4.11 (1.03-17.0)
Unknown	37	17	
Mean blood pressure(SD)			
Systolic	166 (31)	173(29)	p=0.379
Diastolic	109 (19)	118 (19)	p=0.170
Complications			
No	93	14	1
Yes	18	26	9.60 (3.92-23.9)
Number of complications			
None	93	14	1
1	18	26	9.60 (3.92-23.9)
≥2	3	9	19.9 (4.15-15-
122.9)			
ICU admission			
No	98	25	1
Yes	13	15	4.52 (1.76-11.7)
Complications in ICU patients			
DIC (n=8)	0	5	
Thrombocytopenia (n=16)	3	5	
Renal failure (n=9)	1	6	
CVA(n-6)	0	5	

SD Standard deviation.
ICU Intensive care unit.
DIC Disseminated intravascular coagulation.
CVA Cerebrovascular accident.

Women who had more than two seizures had poor maternal outcome, (OR 4.11; 95% CI 1.03 to 17.0). Although the blood pressure was marginally higher in the women who died, the difference was not significant. Complications were recorded more frequently in the women who died, 26/40 versus 18/111 ($p<0.001$). The complications included disseminated intravascular coagulation (DIC), thrombocytopenia, renal failure and cerebro-vascular accident. There was a direct relationship between number of complications and maternal outcome.

Glasgow coma scale rating was performed by one observer in 14 women. There was no correlation between the level of consciousness and maternal outcome.

Only 28 women (19%) were admitted to the intensive care unit (ICU). A higher proportion of women who later died had been admitted to ICU, 42.4% versus 11.9% ($p < 0.001$) for dead and survivors respectively.

Nine women (6.0%) died before delivery. The overall Caesarean section rate was 63.0%. Among women with antepartum eclampsia, the Caesarean section rate was 81.7%. There was a significant difference in Caesarean section rates among the women who survived (89.7%) and those who died (60%) (OR 0.15; 95% CI 0.02 to 0.82). The perinatal mortality rate in women who suffered *antepartum* seizures was 146/1 000, which was much higher than the 53/1000 for the GHMU.

Table IV: Assessment of clinical management; odds ratio and 95% CI with survivors as referents.

Characteristic	Survivors	Dead	OR (95%CI)
Mode of delivery in women with *antenatal* fits			
Spontaneous vaginal	2	4	1
Assisted vaginal	5	6	0.72 (0.08-6.66)
Caesarean section	61	15	0.15 (0.02-0.82)
Convulsion to delivery interval			
≤6	22	5	1
6-12	34	6	0.78 (0.18-3.41)
≥12	16	6	1.65 (0.36-7.79)
Unknown	16	18	
Assessment of clinical management			
Satisfactory	88	25	1
Unsatisfactory	23	15	2.55 (1.09-5.99)
Inadequate monitoring	3	8	9.39 (2.04-
4.48.8)			
Delayed delivery	20	7	1.23 (0.42-3.54)

The mean seizure to delivery interval was 11.1 (S.D. 9.0) and 13.2 (S.D. 13.1) hours for the women who survived and those who died respectively. There appeared to be no association between seizure to delivery interval and maternal outcome. The time of onset of convulsions was not recorded in some women, especially those with onset of eclampsia at home.

Diazepam was the most frequently used anticonvulsant. Magnesium sulphate was used in combination with diazepam in 39 patients (26%). There were no cases where magnesium sulphate was used as a single agent for the control and prevention of fits.

Delay in achieving a delivery occurred frequently, 18% in both groups, but inadequate monitoring was a common finding in the women who died. Delay in delivery for the hospital was defined as an interval longer than six hours after the decision to deliver had been taken.

Cerebral hypoxia and cerebro-vascular accident (CVA) were the most frequent causes of death accounting for 19 (55.9%) and 10 (29.4%) respectively.

Discussion

Eclampsia remains an important cause of maternal mortality in many developing country settings.[3-4,6-7,10,12] We found advanced maternal age, *antepartum* onset of seizures and multiple seizures to be risk factors for maternal death in eclamptic women. The development of complications and deficiencies in clinical management also contributed to maternal mortality.

In a tertiary unit with women referred after onset of convulsions from an unknown source population, the rate of eclampsia is difficult to compute. We used the HMH deliveries and all women with diagnosis of eclampsia, regardless of location at onset of convulsions, to calculate

the rate of eclampsia for HMH. An alternative, and probably more accurate reflection of the incidence, would have been to consider only women whose first convulsion occurred after admission to HMH which would give an incidence of 1.46/1 000 deliveries. Similar problems in calculating rates for tertiary institutions with no defined source population have been alluded to previously.[4,7,13] The rate of eclampsia in our hospital of 5.9/1 000 was similar to rates from other developing country settings[3,4,7,8] but lower than the 77/1 000 deliveries reported from Turkey.[9] An earlier report from our institution gave an eclampsia rate of 0.6/1 000 deliveries.[13] The difference in incidence rates over the two periods may suggest an increase in the incidence of eclampsia as has been observed from other centres within the sub-region.[7] The incidence of eclampsia in our setting is much higher than the rates reported from Europe and North America.[5,14,15]

Our finding of high maternal complications and mortality associated with *antenatal* onset of convulsions is in agreement with previous reports.[5,13] Of concern is the very high case fatality rate, 26.5% for eclampsia in GHMU. The case fatality for women who experienced their first convulsion in the tertiary hospital was no better, 23.4%. Crowther[16] reported a case fatality of 4% for women booked in the same unit. A high case fatality for eclampsia (21.2%) has also been reported from a similar setting in South Africa.[4] Most reports in similar settings report case fatality rates between 2.9 and 9.5%[3,6-8,12] while case fatality is as low as 0.4% in the western world.[15]

It is generally assumed that women who convulse for the first time within a health institution have a better outcome[3,9] but this was not true for our setting. There was no difference in outcome among mothers who convulsed at home and those who did so after admission to the tertiary unit. This unexpected finding may be a reflection of the clinical management in the hospital. A high proportion (84/151) of patients suffered their first convulsion while under medical supervision, either at the local (n=47) or central unit (n=37). High rates of women suffering their first convulsion in hospital have been reported previously.[5,13,15] The fact that a high proportion of patients convulsed after admission raises the question of how preventable eclampsia is. In the series reported by Sibai[15] 13% of cases experienced their first convulsion while they were on the standard magnesium sulphate regime for pre-eclampsia. Abi-Said *et al*[17] recommended the use of magnesium sulphate for prevention of eclampsia although they acknowledged the occurrence of fits even in patients already on the recommended treatment. Odendaal[18] questions the value of magnesium sulphate as a prophylactic agent in severe pre-eclampsia. It is hoped that the Magpie trial[19] will answer the question of the use of magnesium sulphate in severe pre-eclampsia for prevention of eclampsia.

There was a high rate of unbooked women in both groups (28%). High rates of unbooked patients among women with eclampsia have been reported previously.[3,4,6,8,12] Several reports[4,12,13] have shown a lower case fatality among booked women. There is a suggestion that *prenatal* care could have played a role in the reduction of eclampsia in the developed world[14] but there is no convincing evidence to support this view especially considering the number of booked patients who develop eclampsia under medical supervision. In a proportion of women, there may be no warning signs of the impending eclampsia[6,9] as up to 85% of women have normal *antenatal* findings within seven days of onset of eclampsia[4,5,13] and where such signs exist the medical attendants often fail to take appropriate action.

The number of convulsions had a direct relationship to maternal outcome, with the mortality rising with the number of fits. This finding is in agreement with previous observations.[3,4,9,20] An effective anti-convulsant that prevents further seizures has an important role in the management of women with eclampsia and magnesium sulphate has been shown to be the best agent.[21] Despite having participated in two trials on the use of magnesium sulphate in eclampsia,[10,21] the GHMU has been using this drug in an erratic fashion, partly due to drug non-availability at times. Only 26% of the patients in this series received magnesium sulphate.

Eclampsia is generally a disease of the first pregnancy, 54.7% of this group were *primigravidae*. This rate is comparable to reports from similar settings.[3,4,6-8,12] These were young women with a mean age of 23.2 years (S.D. 6.2) and therefore a mortality rate of 20% is unacceptably high.

There was a high Caesarean section rate (63%) in women with eclampsia compared to the GHMU rate of 15%. Mode of delivery did not appear to have any influence on maternal outcome. There is need to review the indications for Caesarean section in this group of women, as some of them could be induced and deliver vaginally. High Caesarean section delivery has been reported previously.[4,7-9,12,13] We could not find a protective effect of Caesarean section against maternal mortality as reported by others.[3,22] There have been suggestions that a large proportion of women with eclampsia could benefit from induction of labour and a vaginal delivery[20] but only 18.3% (19/104) of women with *antepartum* onset of convulsion were delivered vaginally.

An unexpected result was the lack of association between maternal outcome and the interval between onset of seizures and delivery. The median onset of eclampsia to delivery interval was longer than reported by Crowther[16] from the same unit. The longer interval to delivery again may be a reflection on the declining quality of care associated with the high case fatality rate. Previous reports[3,9] suggested that maternal outcome deteriorated with prolongation of the interval between the onset of seizures and delivery. Breen[20] recommends a four hour interval for stabilisation of the patient prior to delivery, during which time attempts are made to ensure a vaginal delivery by use of misoprostol for induction of labour.

Eclampsia is a multi-organ disease associated with a wide range of complications. Complications occurred more

frequently among the women who died and the risk of mortality increased with multiple complications. High rates of complications in women with eclampsia appear to occur frequently.[6,9,12] There were deficiencies in the clinical management in both groups of women, but the proportion of women with sub-optimal clinical management was higher in the women who died (21%). Poor clinical judgement and delay in delivery were the most common clinical deficiencies. Crowther[16] reported poor monitoring in up to 50% of eclamptic women in the same unit. Sub-standard care has also been identified as a contributor to the high maternal mortality in other settings.[4,7] The case fatality could be reduced by improving clinical management.

The major causes of death were cerebral hypoxia related to the seizures and cerebro-vascular accidents (intra-cerebral haemorrhage).

The main limitations of the inquiry were the missing information from the clinical records especially for women referred from outside the Unit and the bias due to non-blinding for maternal outcome. The tendency was to be more critical in cases of maternal death.

Potential for Reducing Case Fatality.

The case fatality rate for eclampsia over the 18 month period was unacceptably high and was associated with deficiencies of care at all levels. The protocol for the management of eclampsia should be adhered to and the supply of an effective anti-convulsant (magnesium sulphate) needs to be improved. There is need for co-operation with anaesthetists and physicians in the management of eclampsia as there is a high frequency of complications in these patients. Despite the more frequent complications, monitoring was poor in the women who died. There is a need, therefore, to improve and strengthen the provision of emergency obstetric care.

Conclusion

Older women with multiple convulsions, especially those that commence *antepartum* are more likely to die from eclampsia. The case fatality for eclampsia was high and there is scope for reduction as avoidable factors were identified in a high proportion of cases. The clinical management in cases of eclampsia needs to be more aggressive if mortality is to be reduced.

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