

RISK FACTORS FOR MATERNAL MORTALITY AMONG ECLAMPTICS IN HAWASSA UNIVERSITY REFERRAL HOSPITAL, 2016

Solomon F., MD; Kasay Z., MD, MSc

¹Hawassa University Referral Hospital,

²Dire Dawa Administrative Regional Health Bureau

ABSTRACT

INTRODUCTION: Globally eclampsia is an important cause of morbidity and mortality during pregnancy, child birth and puerperium. Early intervention and provision of critical care for those at risk of significant morbidity and mortality is important.

OBJECTIVE: To identify important risk factors for maternal mortality among eclamptic women managed in Hawassa University Referral Hospital.

METHODOLOGY: A five years retrospective case - control analysis of risk factors for maternal mortality among eclamptic women was done. Cases were those mothers who died and the controls were those who survived. Data was collected from patient charts and variables were assessed among cases and controls to identify risk factors for mortality. Odds ratio with 95% confidence interval and P- values were computed.

RESULTS: The majority of eclamptics were below 26 years of age, 95 (65 %); primigravida, 76 (52 %) and from out of Hawassa, 95 (65 %). Five or more convulsions before admission (OR = 3.90, 95%CI, 1.64 - 9.37), creatinine level above 0.9 mg/dl (OR = 7.73, 95%CI, 2.84 - 21.63) and platelet count less than 100,000/mm³ (OR = 11.20, 95%CI, 3.70 - 36.32) were significantly associated with the risk of mortality at admission. The case fatality rate of eclampsia was 24% and the most important causes of deaths were respiratory failure and acute renal failure.

CONCLUSION: Closer follow up should be considered for those eclamptics with 5 or more convulsions before admission; and elevated creatinine level and thrombocytopenia at admission. The quality of care provided in the intensive care unit should be improved.

KEY WORDS: Eclampsia, Risk factors for maternal mortality at admission

INTRODUCTION

Eclampsia is a multi-systemic disease with significant maternal complications and is one of the most important causes of maternal mortality in the world.

The incidence of eclampsia is cited to be in the order of 2–8 cases per 10,000 deliveries in developed countries and up to 16–69 cases per 10,000 in developing countries^(1,2). Several recent studies from Canada and Ireland have demonstrated a decline in eclampsia incidence over time. Liu et al found a decline from 12.4 per 10,000 to 5.9 from 2003 through 2009 in Canada, while O'Connor et al found a decline from 5.4 per 10,000 to 3.5 over a span of 30 years in Ireland^(1,3). Incidence surveys have been undertaken in England and Wales since 1922: these show a continuous decline in both incidence and deaths from the condition⁽⁴⁾. However epidemiological studies conducted during the last decade showed no decline in the incidence of eclampsia in developing countries. A study done by Wagnew M et al in governmental hospitals in Addis Ababa showed a 154% rise in its incidence in the last five years⁽⁵⁾. Eclampsia currently is also the leading cause of maternal death in our country unlike the previous decades when the proportion of deaths from eclampsia has been rising but from abortion and other causes has been declining⁽⁶⁾.

Eclampsia is associated with significant maternal morbidities like pulmonary oedema, aspiration pneumonia, acute renal failure, disseminated intravascular coagulation, intracranial bleeding and abruption placenta⁽⁷⁾. Of eclamptic cases, 2–20% are complicated by perinatal loss, while 1–20% are complicated by

maternal fatality, with the highest rates of morbidity and mortality in developing countries⁽⁸⁾.

The management of eclampsia includes controlling the blood pressure and the convulsion; and supportive care which includes the management of complications.

The objective of this study is to identify important independent risk factors for mortality among eclamptic mothers admitted and managed in Hawassa University Referral Hospital (HURH). The hospital is the only referral hospital in the Southern Ethiopia providing a comprehensive obstetrics and intensive care services.

METHODS

In this retrospective case - control study, patients diagnosed as eclampsia between September 2008 and August 2013 in the Department of Gynecology and Obstetrics of HURH were included: cases were those who died and the controls were those who survived. Patients' information was obtained from hospital records. The exclusion criteria were pregnant patients with hematologic or other diseases with increased hepatic enzyme levels and convulsions due to other causes like epilepsy, severe malaria and meningitis.

Eclampsia is defined as the occurrence of seizures in a woman with preeclampsia that cannot be attributed to other causes.

Gestational weeks of the patients were determined according to the last date of menstruation and/or ultra-sonographic measurements. Vital signs of all patients were monitored, and magnesium therapy was

initiated. Loading dose of magnesium (4 g) was administered in 20 minutes followed by 10gm intramuscular stat, and maintenance dose 5gm intramuscular was given every 4 hours till 24 hours after delivery. Diazepam instead of magnesium sulphate was administered if the urine output was not adequate. At the time of admission, variables such as blood pressure, whole blood counts, SGOT, SGPT, and serum creatinine were evaluated. Termination of the pregnancy was done for all eclamptic women after stabilization. Vaginal delivery was preferred; however, in the presence of unfavorable cervix, fetal distress, malpresentation and in patients with previous caesarian delivery abdominal delivery was made. The association between maternal age, address, ANC booking, gestational age, parity, onset of convulsions, number of convulsions before admission, convulsion to delivery interval, systolic and diastolic blood pressure, platelet count, levels of SGOT, SGPT and creatinine levels were evaluated for use as risk factors of the maternal mortality.

Means and standard deviations (SD) were calculated for continuous variables. The Chi-square test and the Student's t test were used to evaluate differences between the categorical and continuous variables. Logarithmic transformation (\log_{10}) was performed to correct the variance of SGPT, and SGOT, as the range of those distributions was very large. The logistic regression analysis was used to find the independent risk factors at the time of admission for mortality among eclamptic patients and to calculate the odds ratios.

Two-sided p values were considered statistically signifi-

cant at $p < 0.05$. Statistical analyses were carried out using the statistical package SPSS 16 and EPi Info version 6.

RESULTS

From September 1, 2008 to August 31, 2013, a total of 174 mothers with a diagnosis of eclampsia were admitted to the labor and maternity ward of HURH. One hundred and sixty three (93.6%) charts of eclamptic mothers were retrieved and 146 (89.5%) charts were reviewed. Of the remaining 28 charts, ten lost, thirteen incomplete and five excluded by exclusion criteria which were two epilepsy cases, two severe malaria, and 1 meningitis cases that was transferred to medical side.

Among patients who were admitted to the hospital with a diagnosis of eclampsia, ninety four (64.4%) patients developed one or more maternal complications and there were 35 maternal deaths, making the case fatality rate of eclampsia to be 24%.

Mean age of the mothers was 24.71 ± 4.57 years. Majority of the patients were in the age group of 21-25 years; 55 (37.7 %) and came out of Hawassa, 95 (65 %). Primigravidas constituted the highest number of eclamptics; 76 (52 %). Majority of eclamptic mothers had at least one ANC follow up (84.2 %). Regarding the gestational week the highest proportion of eclamptics presented at or above 37 weeks of pregnancy (42.5 %) and only 7.3 % of them were below 28 weeks (Table 1).

Majority of patients 95(65 %) had their convulsion before the onset of labor while 41(28 %) were intrapartum and the remaining 10(7 %) occurred postpar-

tum. One hundred twenty three (84.2%) patients had reported symptom before convulsion; headache 110 (75.3%), blurred vision 89(61%) and epigastric pain 40(27.4%) while the rest 23(15.8%) had no any premonitory symptoms. The majority of eclamptics had less than 5 convulsions before admission (61 %); however, more cases (62 %) than the controls (31 %) had more than 5 convulsions before being admitted to the hospital which was found to be statistically significant risk factor for mortality among eclamptics in this study with OR = 3.90, 95%CI, 1.64 - 9.37 (Table 2 and 3). For the majority of the cases the interval between the first convulsion to delivery was 12 hours or more (77 %) but it was only in 37 % of the controls. This finding was also found to be statistically significant, OR = 5.60, 95%CI, 2.17 - 14.89 (Table 2 and 3).

The mean maximum admission systolic blood pressures were 163.53 ± 30.74 mm hg and 163.60 ± 18.53 mm hg for the cases and the controls, respectively. The mean maximum admission diastolic blood pressures were 109.41 ± 16.87 mm hg and 109.37 ± 13.02 mm hg for the cases and the controls, respectively. There was no statistical significant difference between the cases and the controls regarding the mean maximum admission systolic and diastolic blood pressures.

The mean admission logSGOT and logSGPT were 1.9 ± 0.5 and 1.9 ± 0.4 for the cases; and 1.8 ± 0.3 and 1.7 ± 0.3 for the controls, respectively. There was a statistically significant association between these transaminases and mortality among eclamptics in this study (Table 3).

About 80 % of the cases had platelet count less than $100,000/\text{mm}^3$ at the time of admission compared to only 32 % of the controls as seen on Table 2. This finding showed a statistically significant difference between the cases and the controls (OR = 11.20, 95% CI, 3.70 - 36.32). Regarding the serum creatinine level at admission, the majority of the controls (60 %) had a normal value (≤ 0.9 mg/dl); but a significant proportion of the cases (68.6 %) had a serum creatinine value above 0.9 mg/dl. This finding was also significantly associated with the risk of dying from eclampsia, OR = 7.73, 95%CI, 2.84 - 21.63 (Table 2 and 3).

The most important complications were respiratory complications and oliguria. Respiratory complications included aspiration pneumonia, pulmonary edema and hospital acquired pneumonia. About 34% and 17% of the total eclamptics developed pulmonary complications and oliguria after admission to the hospital. There were a statistically significant associations between these complications and the risk of mortality, OR = 5.02, 95%CI, 2.08 - 12.23 and OR = 13.63, 95%CI, 4.67 - 41.09 respectively (Table 3).

On multivariate analysis of risk factors for mortality at admission to the hospital namely the logSGOT, logSGPT, number of convulsions before admission, platelet count and serum creatinine level, it was found out that 5 or more convulsions before admission (OR = 5.68, 95%CI, 1.81 - 17.84), platelet count less than $100,000/\text{mm}^3$ (OR = 8.75, 95%CI, 2.76 - 27.78) and serum creatinine level above 0.9 mg/dl (OR = 9.33, 95%CI, 2.85 - 30.48) were inde-

pendent risk factors for mortality among eclamptics in this study.

DISCUSSIONS

The case fatality rate of eclampsia in this study (24%) was found to be higher than other similar studies done in similar facilities, 5% in Tanzania and 8% in Nigeria ^(9,10). Although the case of fatality rate is a result of different factors including delay in detection of disease early at the preeclamptic stage, it mainly reflects the sub optimal quality of care given by the hospital regardless of the hospital being the only one in the area where more critical patients are referred.

Different similar studies demonstrate that age greater than or equal to 30 years, low socioeconomic status black race, multiparity, having no ANC, gestational age remote from term and the presence of lateralizing signs to be independent risk factors for mortality in pregnancy complicated with eclampsia ^(11,12). These risk factors are related with the severity of the diseases or the availability of services especially critical care service or otherwise due to the awareness or the health seeking nature of the community.

Other studies revealed that SGPT, SGOT, serum LDH level, serum bilirubin level, HCT and thrombocytopenia and the presence of post partum hemorrhage as independent risk factors for mortality in eclamptic women ^(13, 14). Increased systolic and diastolic blood pressures are also associated with the risk of mortality ^(15, 16). These risk factors reflect the involvement of multiple systems and the presence of complications or the failure to detect and manage them might be the strong risk factors behind. It may also

reflect the contribution of HELLP syndrome for mortality in eclamptics. Systolic hypertension of eclampsia is an etiologic factor for increased risk of maternal mortality. Evaluation of previous literature findings has revealed that intracerebral bleeding due to hypertension was also linked with increased mortality ⁽¹⁷⁾. Cerebrovascular events in eclampsia appear to constitute a continuum characterized by an initial, reversible phase of vasogenic edema and seizures caused by hypertension, along with endothelial dysfunction ⁽¹⁸⁾. Still, hypertension associated with HELLP syndrome also disrupts blood-brain barrier secondary to endothelial dysfunction ⁽¹⁶⁾.

These findings are not similar with the findings of this study where serum creatinine level, thrombocytopenia and increase numbers of convulsions are the most important independent risk factors. These differences might be due to the differences in the sample size and study facilities as well as the differences in the study populations.

However, the finding of this study is similar with other studies where the increased numbers of convulsions before admission to the hospital was found to be an independent risk factor for mortality in pregnancies complicated with eclampsia ⁽¹⁹⁾. Increased number of convulsions before admission in eclamptic women may explain the presence of profound brain edema or intracerebral bleeding due to the diseases advancement and severe hypertension or failure of early initiation of care.

The most important complications in this study were respiratory complications 50 (34%), oliguria 26 (18%)

and abruption placentae 17(12%), while the most important causes of mortality were respiratory failure 12 (35%), acute renal failure 9 (26%) and multiple organ failure 7 (20%) which are directly or indirectly related with the most important independent risk factors of mortality in the eclamptic women in this study, namely the increased number of convulsions before admission and increasing level of serum creatinine. It may be important to improve the quality of care delivered to eclamptic women with respiratory failure as well as to monitor the serum creatinine level of eclamptic women and to consider a dialysis service in the hospital

in order to decrease mortality in eclamptic women in the hospital. Regarding the management of eclamptics in the intensive care unit there were lots of deficits observed. To mention few points only 5 eclamptics out of 12 mortalities with respiratory failure were intubated, the rest were getting oxygen with face mask and nasal catheter. Only 2 cases of acute renal failure out of 9 were referred for dialysis to Saint Paul's hospital. This is mainly due to the absence of anesthesiologists in the hospital.

A well noted fact in the analysis of these cases was the absence of adequate and appropriate investigations. The association of deranged liver enzyme levels and thrombocytopenia with mortality of eclamptic women on the bivariate analysis might tell the contribution of HELLP syndrome if serum LDH, HCT and peripheral morphology were included in the evaluation of these patients as some literatures found out that

HELLP syndrome is concomitantly found in 5 - 6 out of 10 deaths associated with eclampsia (20, 21).

CONCLUSION AND RECOMMENDATIONS

Increased level of serum creatinine, thrombocytopenia and number of convulsions before admission are important independent risk factors for mortality in eclamptics in the hospital. It is important to have a closer follow up for eclamptics with these risk factors in the hospital. Having a dialysis service and anesthesiologists in the hospital should be considered a priority to improve the quality care.

Table 1 – Demographic and obstetric variables of eclamptics admitted to HURH, Hawassa, Ethiopia, 2008 – 2013.

Variables		Cases		Controls		Total	
		Number	Percent	Number	Percent	Number	Percent
Age in years	≤ 20	8	23%	32	29%	40	27.4%
	21 – 25	17	49%	38	34%	55	37.7%
	26 – 30	6	17%	31	28%	37	25.3%
	>30	4	11%	10	9%	14	9.6%
Address	Total	35	100%	111	100%	146	100%
	Hawassa	17	48.6%	34	31%	51	35%
	Out of Hawassa	18	51.4%	77	69%	95	65%
Marital status	Total	35	100%	111	100%	146	100%
	Married	25	71.4%	64	57.7%	89	61%
	Single	10	28.6%	42	42.3%	57	39%
ANC booking	Total	35	100%	111	100%	146	100%
	Yes	30	85.7%	93	83.8%	123	84.2%
	No	5	14.4%	18	16.2%	23	15.8%
Parity	Total	35	100%	111	100%	146	100%
	Primigravida	16	45.7%	60	54%	76	52%
	1 – 5	15	42.8%	48	43%	63	43.2%
	≥6	4	11.4%	3	2.7%	7	4.8%
Gestational age	Total	35	100%	111	100%	146	100%
	<28 weeks	2	5.7%	8	7.3%	10	6.8%
	28-33 weeks	15	42.8%	35	31.5%	50	34.2%
	34-36 weeks	4	11.5%	20	18%	24	16.5%
	≥37 weeks	14	40%	48	43.2%	62	42.5%
Pregnancy	Total	35	100%	111	100%	146	100%
	Singleton	33	94%	103	93%	135	93.2%
	Twin	2	6%	8	7%	10	6.8%
	Total	35	100%	111	100%	146	100%

Table2. Clinical and Laboratory Variables of Eclamptics Admitted to HURH, Hawassa, Ethiopia, 2008 –

Variables		Cases		Controls		Total	
		Number	Percent	Number	Percent	Number	Percent
Time of onset	Antepartum	21	60%	74	66.7%	95	65%
of convulsion	Intrapartum	12	34.3%	29	26.1%	41	28%
	Postpartum	2	5.7%	8	7.2%	10	7%
	Total	35	100%	111	100%	146	100%
Number of convulsions	1- 4	13	37.2%	76	68.4%	89	61%
before admission	5-10	11	31.4%	29	26%	40	27.4%
	>10	11	31.4%	6	5.4%	17	11.6%
	Total	35	100%	111	100%	146	100%
First convulsion to	<12	8	22.8%	68	61.3%	76	52%
delivery interval in hours	12-24	20	57.2%	33	29.7%	53	36.3%
	>24	7	20%	8	7.2%	15	10.3%
	Unknown			2	1.8%	2	1.4%
	Total	35	100%	111	100%	146	100%
Platelet count	<100,000/mm ³	28	80%	36	32.4%	64	43.8%
at admission	≥100,000/mm ³	5	14.3%	72	64.9%	77	52.8%
	Unknown	2	5.7%	3	2.7%	5	3.4%
	Total	35	100%	111	100%	146	100%
Creatinine level	≤0.9 mg/dl	8	22.9%	67	60.4%	75	51.4%
at admission	>0.9 mg/dl	24	68.6%	26	23.4%	50	34.2%
	unknown	3	8.5%	18	16.2%	21	14.4%
	Total	35	100%	111	100%	146	100%
Anticonvulsant	Magnesium sulphate	10	28.6%	40	36%	50	34.2%
	Diazepam	25	71.4%	71	64%	96	65.8%
	Total	35	100%	111	100%	146	100%
Pulmonary complication	Yes	22	63%	28	25.2%	50	34.2%
	No	13	37%	83	74.8%	96	65.8%
	Total	35	100%	111	100%	146	100%
Oliguria	Yes	18	51.4%	8	7.2%	26	17.8%
	No	17	48.6%	103	92.8%	120	82.2%
	Total	35	100%	111	100%	146	100%
Focal neurological	Yes	4	11.4%	3	2.7%	7	4.8%
Complication	No	31	88.6%	108	97.3%	139	95.2%
	Total	35	100%	111	100%	146	100%
Abruption placentae	Yes	6	17%	11	10%	17	11.6%
	No	29	83%	100	90%	129	88.4%
	Total	35	100%	111	100%	146	100%

Table 3 – Possible Risk Factors for Mortality among Eclampsics Admitted to HURH, Hawassa, Ethiopia, 2008 – 2013

Variables	Cases		Controls		Test value	OR (95 % CI)	P - Value
	Number	Percent	Number	Percent			
>5 convulsions before admission	22/35	63 %	33/109	30.3%	$\chi^2=11.91$	3.90 (1.64-9.37)	0.000
≥ 12 hours between first convulsion & delivery	27/35	77 %	41/109	37.6 %	$\chi^2=16.61$	5.60 (2.17-14.89)	0.000
Pulmonary complications	22/35	63 %	28/111	25 %	$\chi^2=16.73$	5.02 (2.08-12.23)	0.000
Oliguria	18/35	51.4 %	8/111	7.2 %	$\chi^2=35.55$	13.63 (4.67-41.09)	0.000
Platelate count below 100,000/mm ³	28/33	84.8 %	36/108	33.3%	$\chi^2=27.06$	11.20 (3.70-36.32)	0.000
Serum creatinine above 0.9 mg/dl	24/32	75 %	26/93	28 %	$\chi^2=21.95$	7.73 (2.84-21.63)	0.000
Mean logSGOT ^a	29/35	82.8 %	73/111	65.8%	t=2.039	_____	0.042
Mean logSGPT ^b	30/35	85.7%	81/111	73%	t=2.057	_____	0.044

a= mean admission logSGOT \pm standard deviation for the cases was 1.8 ± 0.3 and for the controls was 1.9 ± 0.5 . b= mean admission logSGPT \pm standard deviation for the cases was 1.7 ± 0.3 and for the controls was 1.9 ± 0.4 .

REFERENCES

1. Liu S, Joseph KS, Liston RM, et al. Incidence, risk factors, and associated complications of eclampsia. *Obstet Gynecol.* 2011;118:987-94.
2. Tan KH, Kwek K, Yeo GS. Epidemiology of pre-eclampsia and eclampsia at the KK Women's and Children's Hospital, Singapore. *Singapore Med J.* 2006;47:48-53.
3. O'Connor HD, Hehir MP, Kent EM, et al. Eclampsia: trends in incidence and outcomes over 30 years. *Am J Perinatol.* 2012. doi: 10.1055/s-0032-1331026.
4. AbouZahr C, Guidotti R. Hypertensive disorders of pregnancy. In: Murray, CJL and Lopez, AD, eds., *Health dimensions of sex and reproduction: the global burden of sexually transmitted diseases, maternal conditions, perinatal disorders, and congenital anomalies.* WHO 1998.
5. Wagnew M, Dessalegn M, Trend of Preeclampsia/Eclampsia, Maternal and Neonatal outcomes among women delivering in governmental hospitals, Addis Ababa, Ethiopia, 2015, Amref Health Africa.
6. Abdella A. Maternal Mortality Trend in Ethiopia. *Ethiopian J Health Dev* 2010;24(Special Issue 1):115 - 22.
7. Edgar MN and et al, Maternal and Perinatal Outcomes among Eclamptic Patients Admitted to Bugando Medical Centre, Mwanza, Tanzania, *Afri J Reprod Health* 2012;16(1):35-41.
8. Douglas KA, Redman CW. Eclampsia in the United Kingdom, *BMJ*, 1994;309:1395-400.
9. Urassa DR and et al, Eclampsia in Dar es Salaam, Tanzania, Incidence, outcome and the role of ante natal care, *Acta Obstet Gynecol Scand* 2006;85(5):571-8.
10. Abubeker ET, Pregnancy outcome in eclamptics at the university of Abuja teaching hospital, Gwagwalada, Abuja. *Nigerian Journal of Clinical Practice* 2010;13(4):394-8.
11. Birhanu E, Gaym A, Risk factors for mortality among eclamptics admitted to the surgical intensive care unit at Tikur Anbessa Hospital, Addis Ababa, Ethiopia. *Ethiopian Journal of Reproductive Health* May 2007; Volume 1(Issue 1).
12. MacKay AP, Berg CJ, Atrash HK, Pregnancy-related mortality from preeclampsia and eclampsia *Obstet Gynecol* 2001;97:533-8.
13. Sak ME, Evsen MS and et al, Risk factors for maternal mortality in eclampsia, analysis of 167 eclamptic cases, *Eur Rev Med and Pharmacol Sci* 2012;16(10): 1399-403.
14. Demir Sc and et al, Factors that influence morbidity and mortality in severe preeclampsia, eclampsia and hemolysis, elevated liver enzymes and low platelet count syndrome, *Saudi Med J* 2006;27(7):1015-8.

15. Vigil - De Gracia P, Garcia - Caceres, Thrombocytopenia, hypertension and seizures in eclampsia. *Int J Gynecol Obstet* 1998; 61: 15-20.
16. Martin Jr Jn, Thigpen Bd, Moore Rc, Rose Ch, Cushma Nj, May W. Stroke and severe preeclampsia and eclampsia: a paradigm shift focusing on systolic blood pressure. *Obstet Gynecol* 2005;105:246-254.
17. Schutte Jm, Schuitemaker Nw, Vanroosemale Nj, Steegers Ea. Substandard care in maternal mortality due to hypertensive disease in pregnancy in the Netherlands. *BJOG* 2008; 115: 732-736.
18. Zeeman Gg, Fleckenstein Jl, Twickler Dm, Cunningham Fg. Cerebral infarction in eclampsia. *Am J Obstet Gynecol* 2004; 190: 714-720.
19. Katz VL, Farmer R, Kuller J. Preeclampsia into eclampsia: toward a new paradigm. *Am J Obstet Gynecol* 2000;182:1389-96.
20. Vigil-De Gracia P, Maternal deaths due to Eclampsia and HELLP syndrome. *Int J Gynaecol Obstet* 2009;104(2):90-4.
21. DI Xd, Chen Dj and et al, Clinical outcomes and characteristics of concomitant Eclampsia and hemolysis, elevated liver enzymes and low platelet count syndrome. *Zhonghua Fu Chan Ke Za Zhi* 2010;45(10):740-