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Original Research Article

Maternal Mortality Associated With Eclampsia - A Prospective Observational Study

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Abstract
Background: Eclampsia is still prevalent in India with high maternal and perinatal mortality. This study aimed to estimate the proportion of eclampsia cases, proportion of maternal deaths due to eclampsia, case fatality rate and causes of maternal death in eclamptic women and to determine socio-demographic and clinical characteristics of the women who died due to eclampsia in our institute. **Material and Methods:** This prospective observational study was conducted over a period of one year, in the Department of Obstetrics and Gynaecology, Gajra Raja Medical College, Gwalior (M.P.). All cases of maternal death due to eclampsia were included in the study. Data were extracted from patient files. **Results:** Total number of patients admitted with eclampsia was 261 and total number of women delivered was 9809 so proportion of eclampsia was 2.6%. Eclampsia was the cause of maternal death in 27.27% cases with case fatality rate of12.64% **.** Majority of women who died due to eclampsia were in the age group 20-24 years (69.69%), were primigravidae (66.66 %), were from rural areas (60.60%) and were referred from different hospitals. Deaths were reported more commonly in women presented with antepartum eclampsia and majority of them presented at gestational age between 33- 36 weeks. Majority of women (42.42%) died 72hours after admission. The most common cause of death in eclampsia was pulmonary edema. **Conclusion:** Proper antenatal care, detection of preeclampsia with early management and timely referral of high - risk patients, administration of MgSO4 in correct doses and properly timed caesarean section in selected cases are the measures which can reduce the incidence of eclampsia and associated maternal mortality. Still many cases of eclampsia appear not to be preventable even among women receiving regular antenatal care, which can be due to the abrupt onset and late post partum onset.

Key words: Eclampsia, Pulmonary edema, antenatal care.

1. INTRODUCTION

Maternal mortality is a major indicator to reflect the quality of work on maternal and child health care in a country. It also reflects the educational and socio-economic state of a country as well as public health consciousness. The UN estimates that about 24 million children were born in 2017 in India, and about 35,000 mothers died during childbirth or shortly thereafter, giving an MMR of 145 per 1,00,000 live births. At present, India's MMR is below the MDG target and thereby it becomes important to achieve the Sustainable Development Goal (SDG) of an MMR below 70 by 2030[1].

Causes of maternal deaths are varied. The common causes are obstetric hemorrhage, pregnancy related infection, hypertensive disorders of pregnancy, unsafe abortion and obstructed labor. Around 80% of maternal deaths are due to direct causes occurring during pregnancy, labor and puerperium and 20% are due to indirect causes.

The World Health Organisation (WHO) estimates that at least 16% of maternal deaths in developing countries result from preeclampsia and eclampsia. Approximately 63,000 pregnant women die every year because of these conditions. Preeclampsia/eclampsia ranks second only to haemorrhage as a specific, direct cause of death [2]. The most common causes of maternal death are intracranial bleeding and acute renal failure secondary to abruption placentae [3].

WHO estimates that eclampsia develops in 2.3% of preeclamptic women in the developing world, compared with 0.8% of preeclampsia cases in developed countries [2]. In developed countries with effective antenatal screening, advanced diagnostic and therapeutic interventions eclampsia has become a rare complication of pregnancy, while in developing countries it continues to be a serious problem.

Eclampsia is a life threatening emergency and leading cause of maternal death in India even today. The aim of this study was to estimate the proportion of eclampsia cases, proportion of maternal deaths due to eclampsia, case fatality rate and causes of maternal death in eclamptic women and to study how socio-demographic and clinical characteristics of the women influence maternal death in our institute.

2. MATERIAL AND METHODS

Ethical clearance: The ethical clearance for the study was obtained from "Institutional Ethics Committee, Gajra Raja Medical College, Gwalior (M.P.). IEC approval certificate number is "06/IEC-GRMC/2019".

Study design: This prospective observational study was conducted in the Department of Obstetrics and Gynaecology, Gajra Raja Medical College, Gwalior (M.P.), during a period of 1 year from July 2019 to June 2020.

Study population: Pregnant women with antepartum, intrapartum or postpartum eclampsia who were admitted with history of convulsions or developed after admission, during study period.

Inclusion criteria: All cases of maternal death due to eclampsia occurred during the study period were included in the study.

Exclusion Criteria:

1. Women who are known cases of epilepsy.
2. Seizures due to metabolic disturbances, space occupying lesions or intra cerebral infections.

Data collection: All patients with eclampsia were identified and noted through daily review of admission register. Patients were followed during hospitalization and women who died due to eclampsia were recruited in our study.

A structured data abstraction form was filled which included: maternal age, gravidity, parity, residence, referral status, socioeconomic status, booking status, gestational age, number of

convulsions before admission, treatment received before admission, state of consciousness, blood pressure on admission. Laboratory test results such as complete hemogram including platelet count, liver function tests, renal function tests and coagulation profile were noted. Information regarding anticonvulsants and antihypertensives used was also collected. Mode of delivery, complications and duration of admission to maternal death were noted. This data was obtained from patients case records.

In our institute all the cases of eclampsia were managed with $MgSO_4$ as an anticonvulsant. For recurrent convulsions phenytoin or lorazepam were used in different cases. Injection labetalol as I.V. bolus/ infusion was used to control severe hypertension. After stabilization of patients pregnancy was terminated irrespective of the gestational age. Mode of delivery was decided according to maternal and fetal condition as well as Bishop's score.

The cause of death was determined from the clinical diagnosis. Postmortem examination was not done in any case as consent was not given by the relatives

Data Analysis:

Collected data was entered in MS excel computer software and results were reported as percentage.

We applied the WHO definition of maternal death- the death of a woman while pregnant or within 42 days of terminating a pregnancy, irrespective of the site and duration of pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.

Proportion of eclampsia was expressed as percentage, calculated by dividing the number of eclampsia cases by total number of deliveries during the study period.

Proportion of maternal deaths due to eclampsia was expressed as percentage, calculated by dividing the number of maternal deaths due to eclampsia by the total number of maternal deaths during the study period.

Case fatality rate was expressed as percentage, calculated by dividing the total number of maternal deaths due to eclampsia by total number of eclampsia cases during the study period.

3. RESULTS:

During the study period, total number of women delivered was 9809. Number of women admitted with diagnosis of eclampsia was 261, so the proportion of eclamptic women in our institute was 2.6%. The timing of fits was antepartum in 135 (51.72%), intrapartum in 38 (14.55%) and postpartum in 88 (33.71%) patients.

During the study period total number of maternal deaths occurred were 121. Eclampsia was leading cause of maternal death in 33women, so proportion of maternal deaths due to eclampsia was 27.27% with a case fatality rate of 12.64%.

Following are the results found in patients who died due to eclampsia.

Table No 1: Demographic characteristics (n=33)

S.No.	Characteristic	Number	Percentage
1	Maternal age in years		
	<19	1	3.03
	20-24	23	69.69
	25-29	9	27.27
	>30	0	00

2	Parity Primigravidae Multigravidae	 22 11	 66.66 33.33
3	Locality Rural Urban	 20 13	 60.60 39.39
4	Referral status Direct Referred	 1 32	 3.03 96.96
5	Booking status Booked ANC visits in private Unbooked	 01 05 27	 3.03 15.15 81.81

Table 1 demonstrates demographic characteristics of eclamptic women who died. Majority of women were in the age group 20-24 years (69.69%), were primigravidae (66.66 %) and were from rural areas (60.60%). Majority (96.96%) of women were referred from different hospitals. 27 (81.81 %) patients had no antenatal visits.

Table No 2: Onset of eclampsia

Type of eclampsia	**Number of cases**	**Percentage**
Antepartum	21	63.63
Intrapartum	6	18.18
Postpartum	5	15.15
Total	33	100.0

Table no. 2 shows that deaths were reported more commonly in women presented with antepartum eclampsia 21(63.63%).

Table No 3: Gestational age at the onset of fit

Gestational age in weeks	**Number of cases**	**Percentage**
28-32	03	11.11
33-36	15	55.55
≥ 37	09	33.33
Total	27	100.0

Table no 3 shows that majority of patients who died (55.55%) presented at gestational age between 33- 36 weeks, while 9(33.33%) patients at term and 3(11.11%) patients between 28-32 weeks.

Table No 4: Mode of delivery

Mode of delivery	**Number of cases**	**Percentage**
Vaginal delivery	13	39.39
Lower segment caesarean section	14	42.42
Undelivered	6	18.18
Total	33	100.0

Table no 4 shows that 14 (42.42%) patients were delivered by lower segment caesarean section, while 13 (39.39%) patients delivered vaginally, 6 patients (18.18%) died undelivered.

Table No 5: Indication of caesarean section in eclamptic patient

Indication	**No of cases**	**Percentage**
Poor bishop score	9	64.28
Failed induction	2	14.28
Fetal distress	2	14.28
IUGR with oligohydramnios	1	7.14
Total	14	100.0

Table no 5 shows that in 9 (64.28%) patients indication of caesarean section was unfavourable cervix (poor Bishop's score) followed by failed induction and fetal distress in 2 patients each.

Table No 6: clinical characeteristics of patients (n=33)

S.No.	**Characteristic**	**Number**	**Percentage**
1	State of consciousness		
	Conscious	3	9.09
	Irritable and disoriented	12	36.36
	Semiconscious unconscious	8	24.24
		10	30.30

2	Number of convulsions before start of anticonvulsant		
	1	1	3.03
	2-4	26	78.78
	>4	6	18.18
3	BP on admission		
	<140/90mmHg	4	12.12
	140/90-159/109mmHg	3	9.09
	≥ 160/110mmHg	26	78.78
4	Anticonvulsant given on admission	26	78.78
	Injection MgSO4 Injection Phenytoin	07	21.21
5	Additional anticonvulsant needed	3	9.09
	Injection levetiracetam	12	36.36
	Injection phenytoin Not required	18	54.54
6.	Ventilator support required		
	Yes	23	69.69
	No	10	30.30

Table no 6 shows that majority of women (36.36%) were irritable and disoriented and 30.3% patients were unconscious at the time of admission. 78.78% patients presented with severe hypertension with blood pressure ≥160/110, 2 patients presented with shock with history of hypertension.

Majority of patients (78.78%) had 2-4 convulsions and 18.18% patients had >4 convulsions before start of anticonvulsant. In 26 (78.78%) patients injection MgSO4 was given as anticonvulsant while 7 (21.21%) received injection phenytoin to control fits as first line anticonvulsant. Additional anticonvulsant was started in 15 patients (44.45%).

Table 7: Causes of maternal death in eclampsia

Cause	**Number**	**Percentage**
Pulmonary edema	15	45.45
Pulmonary edema with CVA	6	18.18
Pulmonary edema with shock	1	3.03
MODS	4	12.12
ARF	3	9.09

ARDS with MODS	2	6.06
ARF with PRESS SYNDROME	2	6.06
Total	33	100.0

Table no 7 shows that pulmonary edema was the commonest cause of death in 15 (45.45%) cases. In 8 cases it was present with other complications, like acute renal failure, CVA, shock and MODS.

Table 8. Duration of admission to maternal death

Duration in hours	**Number of cases**	**Percentage**
< 12hours	8	24.24
12 hours – 23hours	5	15.15
24- 47 hours	4	12.12
48-72hours	2	42.42
>72hours	14	6.06
Total	33	100.0

Table no 8 shows that majority of women 42.42% died 72hours after admission, while 24.24% patients died within 12 hours of admission. one patient survived for 11days 9hours 30mins.

4. DISCUSSION:

Eclampsia is defined as the development of seizures that can not be attributed to other causes and/or unexplained coma during pregnancy or postpartum in a woman with preeclampsia. Unfortunately, preeclampsia is not preventable, nor is its onset accurately predictable . Eclampsia is a serious and common complication of pregnancy which contributes significantly to maternal mortality in India. The present study on maternal mortality in eclamptic women was a prospective study, conducted in the Department of Obstetrics and Gynaecology, Gajra Raja Medical College, Gwalior.

In present study, proportion of women admitted with eclampsia in our institute was 2.6%, higher than reported by Manjusha S et al [4] (1.63%) in their study conducted in the Bharti hospital and Research Centre, Pune. The incidence of eclampsia reported in Eastern India was 3.2% in Kerala was 3.8%, 4.9% in Andhra Pradesh and 15% in Madhya Pradesh.

These figures are higher as compared to developed nations, while the incidence in US is 1 in 3250 and 1 in 2000 pregnancies in Europe. WHO estimates the incidence of preeclampsia to be seven times higher in developing countries (2.8% of live births) than in developed countries (0.4%). A preeclamptic woman in a developing country is three times more likely to progress to eclampsia than a woman in a developed country[2].

The reason for higher incidence of eclampsia reported in our study could be explained by our hospital being a tertiary referral hospital received a greater number of cases of eclampsia referred from nearby urban and rural health facilities. In developed countries the incidence of eclampsia is 1/2000 live births because of good antenatal care, early detection and treatment of preeclampsia and uniformity of national health policies while in developing countries the incidence of eclampsia was 6-100/1000 live births[5,6].

Hypertensive disorder of the pregnancy commonly occurs in the women exposed to the chorionic villi for the first time(primigravidas). In present study deaths were reported more commonly in primigravidas (66.66%). Our results were similar to the study done by Swain S, Mahalaxmi G, ad Sharma HK.[7,8,9] In present study, deaths due to eclampsia were reported more commonly in young patients belonging to the age group of 20-24 years (69.69%) followed by 25-29 years age group (27.27%), a finding similar to the study done by Doley R et al in which majority of the patients belonged to 20-25 years (52.83%) followed by 25-29 years (13.21%.)[10]

In present study, majority of the patients who died were referred from nearby rural areas i.e. 32 cases out of 33 cases which shows that still in our country antenatal patients are not seeking proper antenatal care in time. Lack of education, awareness, delay in referral, transportation, and delay in receiving care are still important factors responsible for this high incidence of eclampsia from rural areas.

In present study, most of the patients who died presented with antepartum eclampsia 63.63% followed by intrapartum 18.18% and postpartum 15.15%. In the study conducted by Sunitha TH et al[11] 56% patients had eclampsia during antenatal period. In the study done by Nobis PN et al[12] 50.7% patients were antepartum eclampsia followed by intrapartum (29.3%) and postpartum (28%). Eclampsia is most common in the last trimester and becomes increasingly frequent as term approaches. In more recent years, the incidence of postpartum eclampsia has risen. This is presumably related to improve access to prenatal care, earlier detection of preeclampsia, and prophylaxis use of magnesium sulphate. So it is important that even after delivery careful monitoring must continue for first 48 hours after delivery, as convulsions can occur for the first time or recur postpartum. Anticonvulsant therapy should be maintained for 24 hours after delivery or last convulsion, whichever occurs later. Antihypertensive therapy is continued until diastolic blood pressure decreases to less than110 mmHg. In present study, majority of deaths (55.55%) were reported in women who presented at gestational age between 33-36 weeks of gestation followed by 9 cases (33.33%) who developed eclampsia at term. Our results are similar to the study done by Sharma HK[9] on 66 eclamptic patients in a tertiary center in Assam where they found that 53.53% patients had eclampsia below 37 weeks while 45% presented at >37 weeks of gestation. Findings of Lotha et al were also similar to our study.[13]

In present study, 42.42% patients were delivered by lower segment caesarean section while 39.39% delivered by vaginal route, a similar finding was reported in study done by Doley R et al and S Manjusha et al, but differ from the findings of K Kaur et al[14]. in which they found a greater number of vaginal deliveries 65% while caesarean sections were 35%. Eclampsia per se is not the indication of caesarean section and mode of delivery had no significant effect on the outcome of the eclamptic women as per Ibrahim et al[15] Decision of caesarean section should be taken if vaginal delivery is not occurring in reasonable time period and condition of patient is worsening. Careful and timely selection of the patients for either caesarean section or vaginal delivery usually associated with improved foeto- maternal outcome. In present study the main indications of caesarean section were poor Bishop's score in14 cases (64.28%) followed by failed induction (14.28%) and foetal distress (14.28%), similar results were found in study done by Ndaboine et al.[16]

In present study, we found that 12 patients (36.36%) were disoriented and irritable and 10 cases were unconscious at the time of admission which shows that significant number of the patients had brain involvement at the time of admission responsible for poor maternal outcome. Twenty-six patients had 3-4 episodes of convulsion before the start of anticonvulsant therapy. As the number of convulsions increases there will be significant brain involvement which worsens the patient's prognosis.

In present study, 26 patients received injection Magnesium sulphate loading and maintenance dose as per Pritchard's regimes while 7 patients received injection Phenytoin loading and maintenance dose as first line anticonvulsant as Magnesium sulphate was contraindicated in these patients. Additional anticonvulsants like phenytoin and leveteracitam was required in 12 and 3 cases respectively.

Twenty-six patients had blood pressure >160/110 mmHg at the time of admission. This dangerous hypertension can cause cerebrovascular hemorrhage and hypertensive encephalopathy, placental abruption, congestive heart failure, and it can trigger eclamptic convulsions in women with preeclampsia.[17]

Ventilatory support was required in 23cases (69.69%) because most of the patients came in very critical condition. 10 cases were unconscious and 12 cases were irritable and disoriented at the time of admission. They were managed in obstetric ICU but these patients were not survived because of the severity of their disease.

In our study total number of maternal deaths occurred were 121. Eclampsia was leading cause of maternal death in 33(27.27%) women, with a case fatality rate of 12.64%. Case fatality rate was 4.1% in study done by Chuppana R et al [18] which was less than our study and 19.4% in study done by AR Kabine [19] which was higher than our study. Pulmonary edema was the commonest cause of maternal death in 15 (45.45%) cases. Pulmonary edema was the commonest cause of maternal death in eclampsia in study done by Sarkar M et al[20]. In women with eclampsia, the volume of extracellular fluid, manifest as edema is usually greater than that in the normal women. The mechanisms responsible for the development of pulmonary edema is leaky pulmonary capillary, decrease oncotic pressure and injudicious use of intravenous fluids. In 7 cases it was presented with other complications, like CVA, and shock. In three patients acute renal failure was responsible for the maternal deaths. In two cases ARF presented with PRES syndrome. Multiple Organ Dysfunction Syndrome (MODS) was responsible for death in 4 patients. MODS with ARDS caused death in 2 patients.

Majority of women (42.42%) died 72hours after admission, while 24.24% patients died within 12 hours of admission. Because of good ICU care by the anaesthetists and supporting nursing staff we were able to prolonged the duration of survival to some extent but not able to save the life of the patients as most of the patients were very critical at the time of admission. Maximum duration for which a patient survived was 11days 9hours 30mins.

5. CONCLUSION

Proper antenatal care, detection of preeclampsia with early management and timely referral of high - risk patients, administration of MgSO4 in correct doses, properly timed caesarean section in selected cases and timely management of complications of eclampsia in ICU or in HDU set up with adequate staff are the measures which can reduce the incidence of eclampsia and associated maternal morbidity and mortality. Still many cases of eclampsia appear not to be preventable even among women receiving regular antenatal care, which can be due to the abrupt onset and late post partum onset.

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