MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.59218/makrjms.2024.5.203.208

Maternal and Perinatal Outcome in Eclampsia: An Experience from Tertiary Care Teaching Hospital, a Prospective Observational Study

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ABSTRACT

Hypertensive disorders in pregnancy, including preeclampsia and eclampsia, pose significant risks to maternal and perinatal health, particularly in developing countries like India. Eclampsia, characterized by seizures, represents the severe end of this spectrum, contributing to maternal mortality. Despite global efforts, eclampsia remains a major concern, with preventable factors contributing to its incidence and adverse outcomes. This study aims to assess the incidence of eclampsia and its associated maternal and perinatal morbidity and mortality. A prospective observational study conducted over one year in an obstetrics and gynecology department in India involved pregnant patients beyond 24 weeks of gestation with eclampsia. Exclusion criteria included patients with other causes of seizures. Diagnosis involved comprehensive evaluations, including medical history, physical examinations, and obstetric assessments, along with specific diagnostic tests. Treatment followed standard protocols, including magnesium sulfate administration and hypertension management. Data collection encompassed various parameters related to maternal and perinatal outcomes. Demographic and clinical characteristics of 90 study patients revealed a predominance of young women, primarily primigravida, with most cases being un-booked. Antepartum eclampsia was prevalent, with varying numbers of convulsions and delivery intervals. Cesarean section rates were notable, and maternal complications included HELLP syndrome, acute renal failure, and pulmonary edema. Fetal outcomes indicated a majority of live births, although a significant proportion had low birth weights and required NICU support. Eclampsia remains a critical obstetric emergency with significant maternal and perinatal morbidity and mortality. Despite efforts to improve antenatal care and management protocols, challenges persist in preventing and managing eclampsia effectively. Enhancing antenatal care services, early diagnosis, and optimal management strategies are crucial for reducing the burden of eclampsia and improving maternal and perinatal outcomes.

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Key Words
Eclampsia, maternal death, perinatal death, pulmonary edema

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Received: 31 December 2023
Accepted: 27 January 2024
Published: 29 January 2024

Citation: Jalpa Rathod, Surbhi Dineshbhai Chavda, Dhrutiba Vanrajsinh Basiya and Ridhdhi Yogeshbhai Mehta, 2024. Maternal and Perinatal Outcome in Eclampsia: An Experience from Tertiary Care Teaching Hospital, a Prospective Observational Study. Res. J. Med. Sci., 18: 203-208, doi: 10.59218/makrjms.2024.5.203.208

INTRODUCTION

Hypertensive disorders represent a significant subset of medical complications during pregnancy, impacting approximately 5 to 10 percent of all pregnancies[1]. This spectrum of disorders encompasses a range of blood pressure elevations, from mild to severe hypertension, often accompanied by multiorgan dysfunction. Eclampsia stands as the severe end of this spectrum and poses a considerable challenge, particularly in developing countries like India. Preeclampsia, a precursor to eclampsia, is characterized by the onset of elevated blood pressure (>140/90 mm Hg) and proteinuria after 20 weeks of gestation in previously normotensive women[2]. Pre-eclampsia has the potential to advance to eclampsia, marked by the emergence of grand mal seizures, affecting approximately 2.7–8.2 women per 10,000 deliveries[3-4]. Complications arising from pre-eclampsia or eclampsia encompass cerebrovascular accidents, liver rupture, pulmonary edema, and acute renal failure, which may lead to maternal mortality[5]. Adverse perinatal outcomes associated with pre-eclampsia and eclampsia primarily stem from preterm delivery, often prompted by maternal or fetal complications, intrauterine growth restriction (IUGR), and fetal demise[6].

Globally, eclampsia and preeclampsia collectively contribute to approximately 63,000 maternal deaths each year[7], with developing countries exhibiting a case fatality rate of up to 14%[8]. Perinatal mortality rates associated with these conditions vary widely, ranging from 14.6% to 47.4%, with morbidity rates reaching as high as 56%[9-11]. In India, the incidence of eclampsia is estimated to range from 1 in 500 to 1 in 30 pregnancies, corresponding to a prevalence of 0.5% to 1.8%[12].

Maternal mortality attributed to eclampsia often arises from preventable factors such as postpartum hemorrhage (PPH), antepartum hemorrhage (APH), pulmonary edema, aspiration pneumonia, coagulation abnormalities, acute renal failure (ARF), and/or cerebrovascular hemorrhage[13]. In comparison to affluent nations, where perinatal mortality rates typically range from 5% to 11%, poorer countries experience significantly higher rates, accounting for approximately 40% of recorded deaths[13]. Within cases of eclampsia, maternal mortality rates are reported at 31.8%, with a corresponding perinatal loss of 38.6% [13].

The aim of this study is to assess the incidence of eclampsia and to evaluate the maternal and perinatal morbidity and mortality associated with the condition.

MATERIALS AND METHODS

The prospective observational study was conducted for a duration of one year within the Obstetrics and Gynecology Department of Shantaba Medical College and General Hospital in Amreli, Gujarat, India, spanning from July 2022 to June 2023. The study received prior approval from the ethical committee.

Inclusion Criteria: All pregnant patients more than 24 weeks of gestation with eclampsia, managed in our obstetric department.

Exclusion Criteria: Patients with epilepsy or other causes of seizures (epilepsy, fever, electrolyte imbalance and hypoglycaemia) were excluded.

The diagnosis of eclampsia was established through a comprehensive evaluation involving medical history assessment, general physical examinations, and obstetric evaluations. Clinical assessments encompassed general physical examinations, obstetric evaluations, ultrasound examinations, and laboratory investigations, including complete blood counts, renal function tests, liver function tests, and lactate dehydrogenase assessments. Specific investigations tailored for eclampsia diagnosis comprised urine albumin determination using the heat coagulation method, complete blood counts, liver function tests, renal function tests, coagulation profile assessments, platelet counts, and fundoscopy. Treatment protocols followed the standard intramuscular regimen as recommended by Pritchards, which involved the administration of 4 grams of intravenous magnesium sulfate followed by 5 grams administered intramuscularly in each buttock. Subsequently, 5 grams of magnesium sulfate were administered intramuscularly every 4 hours for up to 24 hours post-delivery or following the last convulsion episode, whichever occurred last. Severe hypertension was managed with intravenous Labetalol, with an initial dose of 20 mg followed by subsequent doses of 40-80 mg every 10 minutes until a therapeutic response was achieved. Following stabilization of patients, labor induction, acceleration, or cesarean section was performed as deemed necessary based on obstetric indications.

Data Collection: Encompassed various parameters including antepartum and intrapartum care, blood pressure measurements at admission, presence or absence of proteinuria upon admission via dipstick method, occurrence of eclamptic episodes, timing of initiation of appropriate treatment, onset of seizures, interval between onset of fit and delivery, duration taken to reach a suitable healthcare facility, treatment provided prior to patient referral from peripheral centers, timing of seizure onset in relation to delivery (i.e. antepartum, intrapartum, or postpartum), total number of seizures, maternal outcomes (eclampsia, acute kidney injury, cerebrovascular accidents, pulmonary edema, HELLP syndrome, placental abruption, and maternal mortality), labor details, mode

of delivery, neonatal parameters at birth (including birth weight, APGAR score at 5 minutes, admission to the neonatal intensive care unit [NICU]), NICU stay duration, and neonatal outcomes (such as respiratory distress, intraventricular hemorrhage of grade 3 or higher, sepsis, necrotizing enterocolitis, and bronchopulmonary dysplasia of stage 2 or higher) at 7 days/28 days of life.

Statistical Analysis: Statistical analysis was conducted using GraphPad version 3.0. Descriptive statistics were employed to present the data, with means and standard deviations or medians and ranges provided for continuous variables, and percentages utilized for categorical variables. The distribution of categorical variables, including parity, medical and obstetric history, maternal morbidity, and neonatal morbidity, was expressed as frequencies and percentages.

RESULT AND DISCUSSION

Table 1 summarizes the demographic and clinical characteristics of the study patients, consisting of 90 individuals. The age distribution reveals that 17.78% were between 18 and below 20 years old, 53.33% were aged between 20 and 25, 16.67% were between 26 and 30, and 12.22% were above 30 years old. Regarding parity, 64.44% were primigravida, while 35.56% were multigravida. In terms of booking status, 18.89% were booked, while the majority, comprising 81.11%, were un-booked. Gestational age showed that 64.44% of patients were below 37 weeks, while 35.56% were at or beyond 37 weeks. Eclampsia onset occurred predominantly antepartum in 82.22% of cases, with intrapartum and postpartum instances accounting for 6.67% and 11.11%, respectively. The number of convulsions ranged from 1 to 2 in 52.22% of cases, 3 to 4 in 42.22%, 5 to 6 in 3.34%, and more than 6 in 2.22%. The convulsion to delivery interval was less than 12 hours in 70% of cases, 12 to 24 hours in 27.78%, and more than 24 hours in 2.22%. Lastly, the mode of delivery varied, with 53.33% undergoing vaginal delivery, 2.22% instrumental delivery, and 44.45% undergoing lower segment cesarean section (LSCS).

Table 2 presents the maternal outcomes observed within a cohort of 90 study patients, detailing the incidence and prevalence of various complications. Maternal complications encompass diverse pathological conditions such as HELLP syndrome, acute renal failure, abruptio placenta, postpartum hemorrhage (PPH), pulmonary edema, aspirational pneumonia, respiratory failure, liver failure, disseminated intravascular coagulation (DIC), intracranial hemorrhage, status epilepticus, posterior reversible encephalopathy syndrome, shock, coma, and death. Each complication is quantified by the number of occurrences and expressed as a percentage of the total study population. The table further delineates the proportion of patients who did not manifest any complications, providing comprehensive insights into the maternal health outcomes within the cohort.

Table 3 outlines the neonatal outcomes observed within a cohort comprising 90 subjects. The distribution of birth weights is categorized into four ranges: less than 1500 grams, between 1500 and 2500 grams, between 2500 and 3000 grams, and greater

Table 1: Demographic and Clinical Characteristics of study patients

Parameters	Number (N=90)	Percentage
Age in years		
18 - <20 years	16	17.78
20 - 25	48	53.33
26 - 30	15	16.67
>30	11	12.22
Parity		
Primigravida	58	64.44
Multigravida	32	35.56
Booking Status		
Booked	17	18.89
Un-booked	73	81.11
Gestational Age		
<37 weeks	58	64.44
≥ 37 weeks	32	35.56
Onset of Eclampsia		
Antepartum	74	82.22
Intrapartum	06	6.67
Postpartum	10	11.11
Number of Convulsions		
1 – 2	47	52.22
3 – 4	38	42.22
5 – 6	3	3.34
> 6	2	2.22
Convulsion to Delivery Interval		
< 12 hours	63	70
12 – 24 hours	25	27.78
> 24 hours	2	2.22
Mode of Delivery		
Vaginal	48	53.33
Instrumental	2	2.22
LSCS	40	44.45

Table 2: Maternal Outcomes in the study patients

Parameters	Number (N=90)	Percentage
Maternal Complications		
HELLP syndrome	4	12.90
Acute Renal Failure	2	6.45
Abruptio Placenta	3	9.68
PPH	3	9.68
Pulmonary edema	3	9.68
Aspirational Pneumonia	1	3.23
Respiratory failure	2	6.45
Liver Failure	2	6.45
Disseminated Intravascular	1	3.23
Coagulation		
Intracranial Hemorrhage	1	3.23
Status Epilepticus	1	3.23
Posterior Reversible	3	9.68
Encephalopathy Syndrome		
Shock	2	6.45
Coma	1	3.23
Death	02	6.45
No Complications	59	65.55

Table 3: Neonatal Outcome

Parameters	Number (N=90)	Percentage
Birth Weight		
<1500 gm	30	33.33
1500 – 2500 gm	33	36.67
2500 – 3000 gm	15	16.67
> 3000 gm	12	13.33
Fetal Outcome		
Live Birth	73	81.11
Still birth	12	13.33
Neonatal Death	05	5.56

than 3000 grams, with corresponding frequencies expressed as percentages relative to the total study population. It reveals that 33.33% of neonates weighed less than 1500 grams, while 36.67% fell within the range of 1500 to 2500 grams, 16.67% between 2500 and 3000 grams, and 13.33% weighed over 3000 grams. Furthermore, fetal outcomes are detailed, indicating that 81.11% of neonates were born alive, 13.33% were stillbirths, and 5.56% experienced neonatal death. These findings provide valuable insights into the distribution and outcomes of neonates within the examined cohort.

Eclampsia remains a critical, life-threatening emergency that significantly contributes to maternal and perinatal mortality rates globally[14]. While there has been a notable decline in both the incidence and mortality associated with eclampsia over recent decades[14], our hospital's specific incidence was recorded at 0.76%. This incidence rate falls within the range observed in India, which typically ranges from 0.94% to 1.8% across all pregnancies[15]. Notably, this incidence is lower compared to previously reported studies [14,16-20]. However, it is markedly higher than the incidence observed in developed countries such as Finland (0.024%), the UK (0.072%), and the USA (0.028%)[20].

In our investigation, it was found that 60% of the patients were under the age of 25 years. This finding resonates with similar observations reported by Renu Jain *et al*. and Fernandes J *et al*., suggesting that early marriage and higher rates of conception occur within this age bracket[15,21]. Conversely, in the study conducted by Hussein Attia Sharara, 50% of patients were aged above 33 years[22]. Moreover, Shaheen *et al*. and Sarma *et al*. reported that 63% and 65% of women, respectively, belonged to the age group under 25 years[23,24].

At our tertiary care center, 81.11% of patients were un-booked and referred to us. This finding aligns with studies conducted by Sunita Mor *et al*. and Suparna Grover *et al*., where 96% and 98% of patients, respectively, were also un-booked[14,25]. The lack of antenatal care emerges as a significant concern and a key risk factor for eclampsia development[26-28]. Ghimire S reported that 97% of eclampsia patients did not receive antenatal check-ups[29], while Duhan L et al. found that 96% of cases were un-booked[30].

Primigravid women constituted 64.44% of our study cohort. This finding closely aligns with a study conducted by Murthy *et al*., where primigravida accounted for 70% of cases[31]. Eclampsia incidence was notably higher among young pregnant women, particularly primigravida, a trend consistent with observations made by Shaikh S B *et al*. and Acharya G *et al*.[16,32]. Gautam (Bhattarai) SK *et al*. found that 61.3% of their study sample were primigravida[33]. Therefore, there is a critical need for mandatory and regular screening of young pregnant women, especially primigravida, for preeclampsia/eclampsia. Interestingly, our findings diverge substantially from those noted by Duckitt *et al*. and Berhe *et al*., who identified advancing maternal age as a risk factor for eclampsia[34,35].

Antepartum eclampsia predominated in the majority of cases, accounting for 82.22% of instances. This observation is consistent with findings from Murthy *et al*., where 81.8% of cases exhibited antepartum eclampsia[31], as well as with a study conducted by Dr. Archana *et al*., which reported 87% prevalence of antepartum eclampsia[36]. Additionally, Chaudhary P found antepartum eclampsia in 70% of patients, while Ghimire S observed it in 83% of cases [29,37]. In contrast to our results, Douglas *et al*. reported a higher incidence of postpartum eclampsia in the UK, which may be attributed to robust antenatal care surveillance[38]. Furthermore, Prabhakar *et al*. and Vijayashree M *et al*. observed antenatal eclampsia in 77.4% and 71.2% of cases, respectively[18,39].

In our investigation, cesarean section (CS) was performed in 44.45% of eclamptic women, while 53.33% underwent vaginal delivery. The rate of cesarean section observed in our study is consistent with findings from other investigations. Chaudhary P *et al*. reported a cesarean section rate of 55.31% among eclamptic women[17], while Sunita TH *et al*. documented a rate of 45%[34]. The increasing trend of cesarean section rates may be influenced by factors such as the risk of medical litigation and a preference for a no-risk policy. In our study, indications for cesarean section included poor Bishop score, fetal distress, and repeat cesarean for previous lower segment cesarean section (LSCS). Similarly, Kurude *et al*. identified vaginal delivery as the predominant mode of delivery, accounting for 56% of cases[40].

Within the spectrum of maternal complications, HELLP syndrome accounted for 12.90%, postpartum hemorrhage (PPH) for 9.68%, abruptio placenta for 9.68%, posterior reversible encephalopathy syndrome (PRES) for 9.68%, acute kidney injury for 6.45%, and pulmonary edema for 9.68%. In comparison, Renu Jain et al. reported incidences of 3.2% for HELLP syndrome and 3.2% for PPH[21]. The prevalence of HELLP syndrome was noted as 6% in the study conducted by Suparna Grover *et al*.[25], while PRES accounted for 2% in the investigation by Sunita Mor[14]. In the present study, major maternal complications were observed in 34.45% of cases. This aligns closely with findings from Hussein *et al*., who reported major maternal complications in 33% of cases, and from Lee *et al*., who documented complications in 32% of cases[11,22].

Maternal deaths in our study were primarily attributed to HELLP syndrome and acute renal failure secondary to abruptio placentae. These findings align with similar observations reported in studies

conducted in Nepal and India. Kurude *et al*. documented a maternal mortality rate of 5.3% among eclampsia patients[40], consistent with maternal outcomes reported by Sunita TH, Ghimre S, and Shakya *et al*. [17,29,41]. Additionally, an increase in the number of convulsions was associated with heightened risks of maternal morbidity and mortality[17,39].

Regarding fetal outcomes, 81.11% of cases resulted in live births, while 13.33% ended in stillbirths, and 5.56% in neonatal deaths. Comparative studies by Renu Jain *et al*. and Paresh Shyam *et al*. documented live birth rates of 89% and 83%, respectively[21,42]. Within our study, 56% of neonates weighed less than 2kg at birth, with 40% weighing less than 1.5kg, necessitating neonatal intensive care unit (NICU) support. In contrast, Renu Jain *et al*. reported that 12% of neonates weighed less than 1kg[21]. Several studies have indicated a heightened risk of preterm delivery and low birth weight in eclampsia, alongside an increased incidence of fetal mortality[29,30,37].

CONCLUSION

The findings of this investigation underscore the persistent significance of eclampsia as a critical obstetric emergency within the community, leading to notable maternal and perinatal morbidity and mortality. While effective antenatal care, prompt diagnosis, and appropriate management of mild and severe pre-eclampsia cases can potentially reduce the incidence of eclampsia, it is important to recognize that eclampsia can manifest without preceding signs of pre-eclampsia, thus posing challenges to its prevention. Enhancing antenatal care services, facilitating early diagnosis, implementing robust primary management strategies, and optimizing referral systems are imperative steps towards mitigating the burden of eclampsia.

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