

## Original research article

## A prospective case control study to discover and evaluate the significance of the neonatal outcomes of eclamptic mothers

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### Abstract

**Aim:** The aim of the study was to identify and assess the significance of the neonatal outcomes of eclamptic mothers.

**Methods:** This prospective case control study was carried out in the Upgraded Department of Pediatrics, Patna Medical College and Hospital, Patna, Bihar, India for 7 months. The study comprised newborn babies born to 120 consecutive mothers admitted with eclampsia or with pre-eclampsia but subsequently developing eclampsia along with those born to 120 consecutive non-eclamptic mothers (considered as control) with normal BP.

**Results:** The majority of eclamptic mothers were primigravida (87.5%), <20 years of age (62.5%), non-tribals (77.5%), having body weight of mean  $43.02 \pm 5.36$  kg, height of mean  $147.51 \pm 5.87$  cm, and socioeconomic status of Class IV (89.17%). There was no significant difference observed in respect of age, weight, height, religion, caste, parity, and socioeconomic status between eclamptic and control mothers and thus, the two groups were statistically matched. Neonates of eclamptic mothers were found to have mean body weight of  $2.33 \pm 0.47$  kg, mean head circumference of  $32.24 \pm 1.88$  cm, mean crown heel length of  $46.12 \pm 2.87$  cm, and mean ponderal index of  $2.37 \pm 0.32$ . On the other hand, neonates of control mothers had a mean body weight of  $2.51 \pm 0.26$  kg, mean head circumference of  $32.27 \pm 2.21$  cm, mean crown heel length of  $48.02 \pm 2.79$  cm, and mean ponderal index of  $2.36 \pm 0.39$ . In this study, outcome in newborns of eclamptic mothers was significantly more adverse ( $p < 0.001$ ) than in non-eclamptic mothers (75 vs. 47; odds ratio [OR]=3.151, 95% confidence interval [CI]=1.752–5.636).

**Conclusion:** Eclampsia is a serious risk to maternal health and fetal viability and is one of the important factors responsible for maternal and neonatal mortality and morbidity.

**Key words:** Eclampsia, Late preterm birth, Neonatal outcomes.

### Introduction

Eclampsia (a Greek word meaning shining forth or more literally a bolt from the blue) is an acute and life threatening hypertensive disorder of pregnancy, characterised by the appearance of tonic-clonic seizures and coma that happen during most often during second half of pregnancy, non-attributable to other causes like epilepsy or pre-existing or organic brain disorders<sup>1</sup>, generally in a woman diagnosed with preeclampsia.<sup>2</sup> Preeclampsia is currently classified as a pregnancy-specific syndrome characterized by the presence of new-onset hypertension (a systolic BP >140 mm Hg or a diastolic BP >90 mm Hg) in a previously

normotensive woman after 20 weeks gestation with proteinuria (urinary excret -hour specimen).<sup>2</sup>

The incidence and morbidities associated with eclampsia varies greatly between developed and developing countries. Global and regional estimates indicated a crude incidence of eclampsia fluctuating from 0 to 0.1 in Europe and up to 4% in Nigeria.<sup>3</sup> The case fatality rate (number of deaths/number of cases) of eclampsia ranges from 0-1.8% in high-income countries up to 17.7% in India.<sup>4</sup> These data highlights the impact of the socioeconomic standard and availability of medical facilities on the magnitude of the problem. In UK incidence of eclampsia is 4.9/10000 and in USA it is 4.3/10000 deliveries.<sup>5</sup> Unfortunately, eclampsia still complicates much larger number of pregnancies in world. In, India its incidence is reported to be 220/10000 deliveries.<sup>6</sup> It is estimated that about 7% of maternal mortality is associated with hypertensive disorders of pregnancy, particularly eclampsia.<sup>7</sup> With better antenatal care, early recognition and hospital treatment of severe preeclampsia patients, the incidence of eclampsia can be decreased. But there are a minority of patients in whom eclampsia comes like a “Bolt from the blue”. For these unfortunate and ignorant patients, we can offer service by reducing both maternal and perinatal mortality due to eclampsia by timely intervention and management. However, the studies related to the adverse neonatal outcomes of eclampsia in India are limited. Hence, we planned this study to find out the neonatal outcomes of eclamptic mothers and their significance in a rural tertiary health care institution which caters mainly agro-based village population largely representing the typical pattern of socioeconomic and demographic characteristics of rural India.

### **Material and methods**

This prospective case control study was carried out in the Department of Pediatrics, Patna Medical College and Hospital, Patna, Bihar, India for 7 months. after taking the approval of the protocol review committee and institutional ethics committee.

### **Methodology**

After taking informed consent detailed history was taken from the patient. The study comprised newborn babies born to 120 consecutive mothers admitted with eclampsia or with pre-eclampsia but subsequently developing eclampsia along with those born to 120 consecutive non-eclamptic mothers (considered as control) with normal BP. The non-eclamptic mothers were selected after statistically matching the sociodemographic and nutritional profile such as religion, caste, age, socio-economic status, parity, body weight, and height with those of eclamptic mothers. Mothers <28 weeks of gestation or suffering from essential hypertension, chronic illness, epilepsy, or taking any drug with teratogenicity and those giving birth to twin babies or babies with gross congenital malformation were excluded from both the groups.

All the mothers included in the study were first evaluated clinically by history including age, parity, last menstrual period, and socioeconomic status according to modified Kuppaswamy scale, 2007<sup>8</sup>, detailed data from antenatal records and then by examination including weight, height, and BP.

All the neonates in the labor room or operation theatre were evaluated at birth for birth asphyxia and managed accordingly. Routine Apgar scoring at 1 min and 5 min, capillary blood glucose (CBG), and serum Ca estimation were also done for all at birth. All the neonates were re-examined at 24 h after birth including gestational age according to New Ballard scores<sup>9</sup>, estimation of body weight percentile according to intrauterine weight chart<sup>10</sup> and anthropometry and were routinely followed until completed 7<sup>th</sup> postnatal day or through their

course of illness. Sick neonates of eclamptic and non-eclamptic mothers were further evaluated by sepsis screen as per the institutional protocol, and other relevant investigations like blood culture, CBG, chest x-ray, ultrasonography etc. and treated accordingly. In categorizing the various neonatal outcomes, the WHO working definitions of preterm as delivery before 37 completed weeks of gestation, low birth weight (LBW) as birth weight <2.5 kg, intrauterine growth retardation (IUGR) as birth weight <10<sup>th</sup> percentile according to gestational age, birth asphyxia as APGAR score at one minute < 7, early-onset sepsis (EOS) as onset of sepsis within 3 days of postnatal period, early neonatal death (END) as neonatal death within 7 days of postnatal period, and stillbirth as delivery of dead fetus after 28 weeks of gestation were followed.

### Statistical analysis

All the data were compiled and analyzed in the SPSS (version 22.0) software for appropriate statistical tests. Student t-tests for continuous maternal variables to compare means and Chi-square tests for categorical variables were done to find no significant difference ( $p>0.05$ ) between the two groups of eclamptic and control mothers. Chi-square tests were done to find out the significance ( $p<0.05$ ) of association between neonatal outcomes and eclampsia.

### Results

Demographic details of the study population have been presented in Table 1. A total of 90% of both eclamptic mothers took full course of iron-folate supplementation while 85% received at least three antenatal visits at hospital. A total of 70% had hemoglobin of 10 g% or more, as evidenced from their antenatal records. The majority of eclamptic mothers were primigravida (87.5%), <20 years of age (62.5%), non-tribals (77.5%), having body weight of mean  $43.02\pm 5.36$  kg, height of mean  $147.51\pm 5.87$  cm, and socioeconomic status of Class IV (89.17%). There was no significant difference observed in respect of age, weight, height, religion, caste, parity, and socioeconomic status between eclamptic and control mothers (Tables 2 and 3) and thus, the two groups were statistically matched. Neonates of eclamptic mothers were found to have mean body weight of  $2.33\pm 0.47$  kg, mean head circumference of  $32.24\pm 1.88$  cm, mean crown heel length of  $46.12\pm 2.87$  cm, and mean ponderal index of  $2.37\pm 0.32$ . On the other hand, neonates of control mothers had a mean body weight of  $2.51\pm 0.26$  kg, mean head circumference of  $32.27\pm 2.21$  cm, mean crown heel length of  $48.02\pm 2.79$  cm, and mean ponderal index of  $2.36\pm 0.39$ . In this study, outcome in newborns of eclamptic mothers was significantly more adverse ( $p<0.001$ ) than in non-eclamptic mothers (75 vs. 47; odds ratio [OR]=3.151, 95% confidence interval [CI]=1.752–5.636).

In this study, four significant neonatal outcomes of eclamptic mothers (Table 4) were observed as preterm (OR=3.301, 95% CI=1.672–5.922,  $p=0.001$ ), LBW (OR=3.377, 95% CI=1.965–5.912,  $p<0.001$ ), IUGR (OR=4.597, 95% CI=1.312–17.129,  $p=0.032$ ), and birth asphyxia (OR=2.671, 95% CI=1.328–4.978,  $p=0.011$ ) while other outcomes as hypoxic- ischemic encephalopathy (HIE) (OR=4.721, 95% CI=0.842–21.865,  $p=0.078$ ), EOS (OR=2.741, 95% CI=0.853–8.598,  $p=0.21$ ), END (OR=2.911, 95% CI=0.631–13.436,  $p=0.38$ ), and stillbirth (OR=2.566, 95% CI=0.821–7.865,  $p=0.25$ ) were not significant. Only live born babies were considered for the statistical study of birth asphyxia, HIE, EOS, and END.

**Table 1: Demographic profile of the patients**

Parameter	Cases=120 (%)	Control=120 (%)
Age (years)		
Below 20	75(62.5)	70(58.33)
20–25	26(21.67)	33(27.50)

Above 25	19(15.83)	17(14.17)
<b>Parity</b>		
0	105(87.5)	96(80)
1	15(12.5)	24(20)
<b>Antenatal care</b>		
≤2 visits	18(15)	18(15)
≥3 visits	102(85)	102(85)
<b>Socioeconomic status</b>		
Class III	13(10.83)	17(14.17)
Class IV	107(89.17)	103(85.83)
<b>Weight (kg)</b>		
30–34	14(11.67)	13(10.83)
35–39	20(16.67)	19(15.83)
40–44	62(51.66)	60(50)
45–50	24(20)	25(20.83)
>50	0	3(2.5)
<b>Height (cm)</b>		
132–143	20(16.67)	20(16.67)
145–150	76(63.33)	72(60)
152–168	24(20)	28(23.33)

**Table 2: Student t-test of continuous variables of mothers**

Variable	Category	Cases (%)	Control (%)	p value
Religion	Hindu	95(79.17)	90(75)	0.39
	Non-Hindu	25(20.83)	30(25)	
Caste	General	93(77.5)	85(73.33)	0.47
	Tribal	27(22.5)	35(29.17)	
Parity	Nulliparous	105(87.5)	96(80)	0.38
	Multiparous	15(12.5)	24(20)	
Socioeconomic status	Class-IV	110(91.67)	102(85)	0.44
	Class-I–III	10(8.33)	18(15)	

**Table 3: Chi-square test of categorical variables of mothers**

Variables	Cases (Mean±SD)	Control (Mean±SD)	p value
Age	20.19±1.33	20.39±1.54	0.71
Weight kg	43.02±5.36	42.34±5.39	0.64
Height cm	147.51±5.87	147.69±6.57	0.87

**Table 4: Outcomes of newborns to eclamptic and control mothers.**

Outcomes	Case n (%)	Control n (%)	Odds Ratio (C.I. 95%)	p value (corrected)
Preterm	49 (40.83)	12(10)	3.301 (1.672-5.922)	0.001
LBW	65 (54.17)	34 (28.33)	3.377 (1.965-5.912)	<0.001

IUGR	17 (14.67)	6 (5)	4.597 (1.312-17.229)	0.032
Birth asphyxia	39(32.5)	22 (18.33)	2.671 (1.328-4.978)	0.011
HIE	11(9.17)	3 (2.5)	4.721 (0.82-21.865)	0.078
EOS	12 (10)	5 (4.17)	2.741 (0.853-8.598)	0.21
END	6 (5)	3 (2.5)	2.911 V(0.631-13.436)	0.38
Stillbirth	14 (11.67)	5 (4.17)	2.566 (0.821-7.865)	0.25

## Discussion

The incidence and mortality of eclampsia has fallen dramatically over the past decades. This is likely to be due to better antenatal care combined with improved social and economic conditions. However, in developing countries eclampsia still stands as one of the major complications of pregnancy. In this study, 76.67% of babies of eclamptic mothers ( $p < 0.001$ ) were born with adverse outcomes, which is comparable to the similar studies in India<sup>11-13</sup> and abroad.<sup>14-20</sup> In this study significantly more preterm babies were born to eclamptic mothers (40.83%) ( $p = 0.001$ ). This is comparable to a study done by Singhal et al. which showed that 74.5% of babies were preterm<sup>13</sup> Shaheen et al. also reported 62.5% of preterm births<sup>15</sup> Parveen and Akhter reported 59%<sup>16</sup> while Jha et al. found 50%<sup>17</sup> of preterm births in their studies. In other similar studies, the percentage of preterm births observed by Yaliwal et al. was 17%<sup>12</sup>, 26.1% by George and Jeremiah<sup>14</sup>, and 31.1% by Sangkomkamhang et al.<sup>19</sup> This study also observed an increased incidence of late preterm births (34–36 weeks of gestation) with eclampsia being a significant risk factor ( $p = 0.004$ ). This is comparable to the studies done by Carter et al.<sup>21</sup> and Patil and Patil<sup>22</sup> which suggested eclampsia as one of the most common comorbidities or variables associated with increased risk of late preterm birth. In this study, LBW babies were documented as a significant outcome of eclampsia LBW (OR=3.377, 95% CI=1.965–5.912,  $p < 0.001$ ). Parveen and Akhter and Singhal et al. observed 70%<sup>16</sup>, 68.6%<sup>13</sup> of preterm births, respectively, as compared to Sangkomkamhang et al. who found lesser percentage of 34.4%.<sup>19</sup> IUGR came out as a significant outcome (IUGR (OR=4.597, 95% CI=1.312–17.129,  $p = 0.032$ ) in our study, which is comparable to the observation done by Ayaz et al.<sup>20</sup>, while another study done by Sangkomkamhang et al. showed a lower incidence.<sup>19</sup>

This study also showed birth asphyxia as a significant outcome (OR=2.671, 95% CI=1.328–4.978,  $p = 0.011$ ). This is in accordance with a similar study done by Ayaz et al. who recorded 42.46%<sup>20</sup> birth asphyxia. Other studies by Yaliwal et al. and Singhal et al. reported lesser percentage of birth asphyxia in neonates of eclamptic mothers, i.e., 26%<sup>12</sup> and 25.49%<sup>13</sup>, respectively. Several studies pertaining to outcomes of eclampsia had shown no statistical significance regarding HIE<sup>16</sup>, EOS<sup>12,14,16</sup>, stillbirth<sup>13-15</sup>, and END.<sup>13-16,18</sup> These results were in accordance to our studies. This study was limited by its scope to consider the influence of the therapeutic intervention of eclampsia on the neonatal outcomes since; all patients were compulsorily treated with the institutional protocol of magnesium sulphate regime.

## Conclusion

Eclampsia is a serious risk to maternal health and fetal viability and is one of the important factors responsible for maternal and neonatal mortality and morbidity. We concluded that the eclampsia is an important cause of significant neonatal morbidity in terms of prematurity, LBW, IUGR, and birth asphyxia. It is a significant risk factor for late preterm births as well.

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