Neonatal outcomes of eclamptic mothers in a tertiary government rural teaching hospital of Eastern India

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ABSTRACT

Background: Studies related to the neonatal outcomes of eclamptic mothers in a rural sociodemographic setting of India are not abundant. **Objective:** The objective of the study was to identify and assess the significance of the neonatal outcomes of eclamptic mothers in a rural population. **Materials and Methods:** This was a prospective, cross-sectional, observational, and epidemiological study in a tertiary care government teaching hospital catering rural agro-based population of Eastern India. The study was conducted during April 2012–March 2013 and consisted of two groups. One group comprised neonates born to 100 consecutive eclamptic mothers and another consisted of neonates of 100 non-eclamptic (control) mothers. Both groups were statistically matched after selection through inclusion-exclusion criteria. **Results:** The majority of eclamptic mothers were unbooked, primigravidae (86%), in late teens (66%), belonging to socioeconomic Class IV (92%) of modified Kuppuswamy scale (2007). About 72% of neonates were born with one or more adverse neonatal outcomes ($p<0.001$). Neonatal outcomes as observed in this study were prematurity (40%, $p=0.001$), low birth weight (LBW) (60%, $p<0.001$), intrauterine growth restriction (IUGR) (12%, $p=0.032$), and birth asphyxia (33%, $p=0.016$), while hypoxic-ischemic encephalopathy, early-onset sepsis, early neonatal death, and stillbirth were not found to be statistically significant. Late preterm births were also significant ($p=0.004$). **Conclusion:** Eclampsia in the rural population 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.

Key words: *Eclampsia, Late preterm birth, Neonatal outcomes, Rural population*

Eclampsia (a Greek word meaning shining forth) is an acute and life-threatening hypertensive disorder of pregnancy, characterized by the appearance of tonic-clonic seizures and coma that happens most often during second half of pregnancy, non-attributable to the other causes such as epilepsy or pre-existing or organic brain disorders [1], generally, in a woman diagnosed with pre-eclampsia [2]. Pre-eclampsia is currently classified as a pregnancy-specific syndrome characterized by the presence of new-onset hypertension (a systolic blood pressure [BP] >140 mm Hg or a diastolic BP >90 mm Hg) in a previously normotensive woman after 20 weeks gestation with proteinuria (urinary excretion of ≥0.3 g of protein in a 24-h specimen) [2]. Although the etiopathogenesis is still hypothetical [3], the development of complications such as placental insufficiency [4,5], placental abruption [5,6], and fetal bradycardia [7,8] in pre-eclampsia/eclampsia syndrome may affect perinatal morbidity and mortality adversely.

Over the decades, the incidence of eclampsia in India showed a receding trend with an average being 1.5% according to the reports published from 1976 to 2015 [9]. However, the perinatal mortality in eclampsia is still as high as in 1984 when it was 45% and the corresponding figure in 2010 was 24.5–48% [9]. 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.

MATERIALS AND METHODS

This prospective, cross-sectional, observational, and epidemiological study was conducted in the Departments of Paediatrics and Obstetrics of a Tertiary Care Medical College Hospital, Eastern India from April 2012 to March 2013. The study comprised newborn babies born to 100 consecutive mothers admitted with eclampsia or with pre-eclampsia but subsequently developing eclampsia along with those born to 100 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 Kuppuswamy scale, 2007 [10], detailed data from antenatal records and then by examination including weight, height, and BP. Data from history and clinical examination for the demographic variables of the eclamptic mothers were then collected. They were then computed with those of the non-eclamptic mothers for matching and selection as control group.

All eclamptic mothers were treated routinely as per institutional protocol with magnesium sulfate at a loading dose of 2.5 g deep intramuscular (IM) in each buttock along with 3 g intravenous (IV) bolus over 15 min followed by a maintenance dose of 2.5 g magnesium sulfate deep IM every 4 hourly. Mothers with BP >160/110 mmHg were treated with labetalol 10 mg IV stat followed by repeat doses of 20–40 mg IV, if needed and a maintenance dose at the rate of 10 mg IV 8 hourly or 100 mg po 8 hourly.

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 [11], estimation of body weight percentile according to intrauterune weight chart [12] and anthropometry and were routinely followed until completed 7th 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 xray, 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 <10th 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.

All the data were compiled and analyzed in the SPSS (version 25.0) 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 52% received at least three antenatal visits at local government subcenters. A total of 70% had hemoglobin of 10 g% or more, as evidenced from their antenatal records. The majority of eclamptic mothers were primigravida (86%), <20 years of age (66%), non-tribals (78%), having body weight of mean 41.19±5.0 kg, height of mean 148.34±6.33 cm, and socioeconomic status of Class IV (92%).

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 2.32±0.41 kg, mean head circumference of 31.40±1.86 cm, mean crown heel length of 46.56±2.89 cm, and mean ponderal index of 2.28±0.23. On the other hand, neonates of control mothers had a mean body weight of 2.53±0.46 kg, mean head circumference of 31.48±2.04 cm, mean crown heel length of 47.08±2.98 cm, and mean ponderal index of 2.36±0.18.

In this study, outcome in newborns of eclamptic mothers was significantly more adverse ($p<0.001$) than in non-eclamptic mothers (72 vs. 45; odds ratio [OR]=3.143, 95% confidence interval [CI]=1.746–5.659). The bar diagram (Fig. 1) shows the comparison between different outcomes of neonates of

Table 1: Frequency distribution of maternal sociodemographic profile

Variables	Cases (%)	Control (%)
Age (years)		
17–19	66	62
20–21	22	26
22–24	12	12
Parity		
0	86	80
1	14	20
Antenatal care		
≤2 visits	12	12
≥3 visits	88	88
Socioeconomic status		
Class III	8	12
Class IV	92	88
Weight (kg)		
30–34	10	10
35–39	18	16
40–44	52	50
45–50	20	22
>50	0	2
Height (cm)		
132–143	16	16
145–150	64	62
152–168	20	22

eclamptic and control mothers. In this study, four significant neonatal outcomes of eclamptic mothers (Table 4) were observed as preterm (OR=3.037, 95% CI=1.588–5.808, p=0.001), LBW (OR=3.188, 95% CI=1.784–5.694, p<0.001), IUGR (OR=4.409, 95% CI=1.204–16.141, p=0.032), and birth asphyxia (OR=2.459, 95% CI=1.231–4.913, p=0.016) while other outcomes as hypoxic-ischemic encephalopathy (HIE) (OR=4.530, 95% CI=0.936–21.936, p=0.087), EOS (OR=2.524, 95% CI=0.749–8.507, p=0.211), END (OR=2.733, 95% CI=0.517–14.454, p=0.399), and stillbirth (OR=2.374, 95% CI=0.706–7.978, p=0.251) were not significant. Only live born babies were considered for the statistical study of birth asphyxia, HIE, EOS, and END.

The majority (n=34, 85%) of the preterm newborns of eclamptic mothers were observed as late preterm babies (34–36 weeks of gestation) against only 44.4% (n=8) among the control group (OR=7.083, 95% CI=1.986–25.270, p=0.004).

DISCUSSION

In this study, 72% of babies of eclamptic mothers (p<0.001) were born with adverse outcomes, which is comparable to the similar studies in India [13-15] and abroad [16-22]. In this study, significantly more preterm babies were born to eclamptic mothers (p=0.001). This is comparable to a study done by Singhal *et al*. which showed that 74.5% of babies were preterm [15]. Shaheen *et al*. also reported 62.5% of preterm births [17]. Parveen and Akhter reported 59% [18] while Jha *et al*. found 50% [19] of preterm births in their studies. In other similar studies, the percentage of preterm births observed by Yaliwal *et al*. was 17% [14], 26.1% by George and Jeremiah [16], and 31.1% by Sangkomkamhang *et al*. [21]. 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.* [23] and Patil and Patil [24] 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 (p<0.001). Parveen and Akhter and Singhal *et al.* observed 70% [18], 68.6% [15] of preterm births, respectively, as compared to Sangkomkamhang *et al*. who found lesser percentage of 34.4% [21]. IUGR came out as a significant outcome (p=0.032) in our study, which is comparable to the observation done by Ayaz *et al*. [22], while another study done by Sangkomkamhang *et al*. showed a lower incidence [21].

This study also showed birth asphyxia as a significant outcome (p=0.016). This is in accordance with a similar study done by Ayaz *et al*. who recorded 42.46% [22] birth asphyxia. Other studies by Yaliwal *et al.* and Singhal *et al*. reported lesser percentage of birth

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

Variable	Category	Cases (%)	Control (%)	p value
Religion	Hindu	80	74	0.40
	Non-Hindu	20	26	
Caste	General	78	72	0.41
	Tribal	22	28	
Parity	Nulliparous	86	80	0.35
	Multiparous	14	20	
Socioeconomic status	Class-IV	92	88	0.48
	Class-I–III	8	12	

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

Variables	Cases (Mean±SD)	Control (Mean±SD)	p value
Age	19.50±1.31	19.56±1.35	0.75
Weight	41.19±5	41.51±5.21	0.66
Height	148.34±6.33	148.41±6.21	0.94

SD: Standard deviation

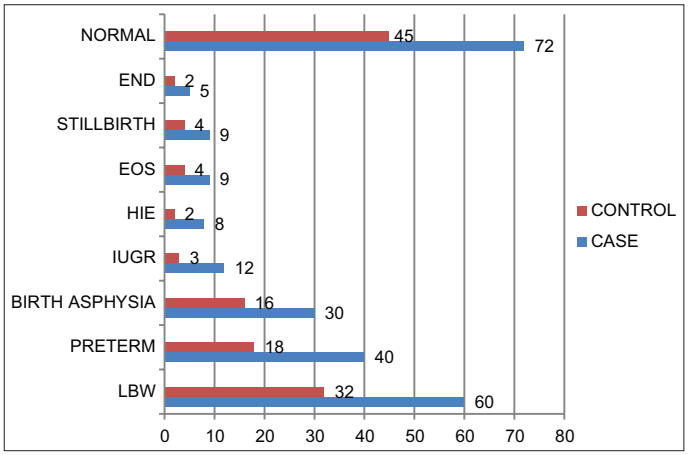

Figure 1: The comparison of outcomes between cases and controls

Table 4: Outcomes of newborns to eclamptic and control mothers

Serial no	Outcomes	Case n (%)	Control n (%)	Odds Ratio (C.I. 95%)	p value (corrected)
1	Preterm	40 (40)	18 (18)	3.037 (1.588-5.808)	0.001
2	LBW	60 (60)	32 (32)	3.188 (1.784-5.694)	<0.001
3	IUGR	12 (12)	03 (3)	4.409 (1.204-16.141)	0.032
4	Birth asphyxia[#]	30 (33)	16 (16.7)	2.459 (1.231-4.913)	0.016
5	HIE[#]	08 (8.8)	02 (2.1)	4.530 (0.936-21.936)	0.087
6	EOS[#]	09 (9.9)	04 (4.2)	2.524 (0.749-8.507)	0.211
7	END[#]	05 (5.5)	02 (2.1)	2.733 V(0.517-14.454)	0.399
8	Stillbirth	09 (9)	04 (4)	2.374 (0.706-7.978)	0.251

[#]cases-91, controls-96

asphyxia in neonates of eclamptic mothers, i.e., 26% [14] and 25.49% [15], respectively. Several studies pertaining to outcomes of eclampsia had shown no statistical significance regarding HIE [18], EOS [14,16,18], stillbirth [15-17], and END [15-18,20]. 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 sulfate regime.

CONCLUSION

Elampsia among rural population of India still remains a significant risk factor for neonatal morbidities like preterm, LBW, IUGR and birth asphyxia. Increased incidence of late preterm births is also significantly associated with eclampsia. This study emphasises the need to prevent development of eclampsia at a community level through ANC's and to enhance neonatal care facilities in outreach areas to reduce the high incidence of perinatal morbidity and mortality due to eclampsia.

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