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# Maternal Diastolic Blood Pressure Affecting Adverse Neonatal Outcomes of Eclampsia in A Rural Tertiary Care Hospital in Eastern India

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**Abstract**

*Context:* Eclampsia is a serious complication of pregnancy that not only affects maternal health but also influences the prospect of neonatal outcomes. *Aims:* The study was carried out to identify different types of adverse neonatal outcomes of eclamptic mothers and to evaluate correlation of those outcomes and physical parameters of neonates with maternal diastolic blood pressure (DBP) recorded at the time of admission. *Design and Setting:* A prospective, cross-sectional, observational, epidemiological study was conducted from April, 2012 to March, 2013 at a tertiary-care Government teaching hospital catering rural population of Eastern India. *Materials and Methods:* The participants comprised of 100 consecutive admitted eclamptic mothers and neonates born to them. Correlation between maternal DBP with each adverse neonatal outcome was studied and analysed in SPSS software (version 25). *Results:* Neonatal outcomes were observed as preterm (40%), low birth weight (LBW) (60%), intra-uterine growth retardation (IUGR) (12%), birth asphyxia (33%), hypoxemic ischemic encephalopathy (HIE) (8.8%), early onset sepsis(EOS) (9.9%), still birth (SB) (9%), early neonatal death(END) (5.5%). Significant inverse correlation was observed between the neonatal physical parameters like body weight, gestational age, Apgar scores (1 min and 5 minutes) and DBP of eclamptic mothers on admission. Maternal DBP ≥ 100 mmHg on antenatally to keep DBP to less than 100 mmHg have a favourable prospect on neonatal outcomes of eclampsia in rural areas.

**Keywords:** Eclampsia; Neonatal outcomes; Diastolic Blood Pressure (DBP).

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## Introduction

Eclampsia (a Greek word meaning shining forth or more literally a bolt from the blue) is one of the hypertensive disorders of pregnancy,[1] characterised by the onset of seizures or convulsions in a woman with pre-eclampsia, which cannot be attributed to any other cause.[2] Pre-eclampsia is another hypertensive disorder of pregnancy characterised by new onset hypertension (a systolic BP >140 mm Hg or a diastolic BP > 90 mm Hg) in a normotensive woman after 20 weeks of pregnancy along with proteinuria.[3]

During a ten year period from 1999 to 2008 the incidence of eclampsia in age group below 20 years was 6.97%[4] in this institution of study while in India the incidence of eclampsia according to the reports published from 1976 to 2015 ranged from 0.179 to 5%[5] against global incidence of 1.0–2.0% of pregnancies.[6]

Though the etio-pathogenesis is still hypothetical,[7] hypertension, reduced perfusion to multiple organs, proteinuria, and loss of fluid from the intravascular space[8] and cerebral oedema with cerebral dysfunction[9] lead to the maternal morbidity and mortality of eclampsia on one hand, while reduced placental perfusion with or without placental abruption[8] affect neonatal outcomes of eclamptic mothers on the other. Although it was initially thought that maternal factors (Stage 2) only interacted with reduced placental perfusion (Stage 1) to produce the maternal syndrome (preeclampsia/eclampsia) according to proposed two-stage model of etio-pathogenesis, it is now believed that maternal factors (Stage 2) may be involved in the genesis of reduced placental perfusion (Stage 1) too[6,7] and thereby may influence neonatal outcomes of eclampsia.

The present study was conducted to identify different types of adverse neonatal outcomes of eclamptic mothers and to evaluate correlation of those adverse outcomes and physical parameters (body weight, gestational age and Apgar scores) of the neonates with maternal diastolic blood pressure of eclamptic mothers on admission in a rural tertiary healthcare institution which caters mainly agro-based village population.

## Materials and Methods

This prospective, cross-sectional, observational, epidemiological study was conducted in the departments of paediatrics and obstetrics of a tertiary care rural teaching hospital in Eastern India from April, 2012 to March, 2013.

The study comprised of 100 consecutive mothers admitted with eclampsia or with pre-eclampsia but subsequently developing eclampsia in the hospital. Mothers less than 28 weeks of gestation or suffering from essential hypertension, chronic illness, epilerpsy, taking any drug with terratogenicity or giving birth to twins or babies with gross congenital malformation were excluded from this study.

All eclamptic mothers included in this study were evaluated through detailed history with clinical examination (including blood pressure estimation at the time of admission etc.) and observation till delivery of the babies. Modified Kuppaswamy scale, 2007[10] was used for classification of socio-economic status (SES) of mothers. They were all treated according to institutional protocol with $MgSO_4$ routinely with loading doses of 2.5 mg deep im in each buttock and 3g iv over 15 minutes along with a maintenance dose (2.5 mg every 4 hourly) and Labetelol if BP on admission was ≥ 160/110 mmHg (10 mg iv stat followed by a maintenance dose of 10 mg iv 8 hourly or 100 mg orally 8 hourly.

All the neonates were evaluated at birth at labor room or OT including management of complications like birth asphyxia, HIE etc. and thereafter observed at sick neonatal care unit (SNCU) with relevant management and investigations according to the clinical conditions. Estimation of gestational age and body weight percentile were done according to New Ballard Scores 11 and intrapartum growth chart 12. All the neonates were thoroughly reexamined at 24 hours of birth and then routinely followed till completed 7$^{th}$ postnatal day or through their course of illness.

In categorising the various neonatal outcomes standard definitions of preterm as delivery before 37 completed weeks of gestation, LBW (low birth weight) as birth weight < 2.5 kg, IUGR (intrauterine growth retardation) as birth weight less than 10$^{th}$ percentile according to gestational age, EOS (early onset sepsis) as onset of sepsis within 3 days of potnatal period, END (early neonatal death) as neonatal death within 7 days of postnatal period and SB (still birth) as delivery of dead fetus after 28 weeks of gestation were followed.

All the data were analysed in the SPSS (version 25.0) software for appropriate statistical tests. *P*-value <0.05 was considered significant both for Pearson coefficient of correlation of continuous variables and for Chi-square test of association of categorical variables.

## Results

In this study majority of eclamptic mothers (86%) were and nulliparous primigravidae. Majority of the mothers (66%) were below 20 years of age while the mean age was 19.50 ± S.D. = 1.307. The mean weight of mothers was 41.9 kgs ± S.D. = 4.996 as per the records of fist antenatal visit. Most frequent (52%) weight range was 40–44 kgs. The height of the mothers was most frequently (54%) observed in the range of 145–150 cm while the mean height was

148.34 cm ± S.D. = 6.330. Though 52% of mothers had attended at least three antenatal check-ups (ANC) at the peripheral Government facilities, 82% of antenatal cards had no regular record of maternal B.P. Most of the mothers belonged to class-IV in Kuppaswamy socio-economic scale (92%). Majority of them were unbooked or referred from peripheral hospitals (80%) and had as such eclamptic fits before admission to this tertiary care hospital (86%) (Table 1).

In this study mean DBP of eclamptic mothers was found 99.16 mmHg ± S.D. = 13.316, while 38% of mothers had their DBP ≤ 90 mmHg, 22% had DBP between 91–100 mmHg and 40% had DBP > 100 mmHg.

**Table 1:** Frequency distribution of maternal socio-demographic profile

| Variable | Groups | Percentage |
|---|---|---|
| Age | 17–19 years | 66 |
| | 20–21 years | 22 |
| | 22–24 years | 12 |
| Parity | 0 | 86 |
| | 1 | 14 |
| ANC | ≤2 visits | 12 |
| | ≥3 visits | 88 |
| SES | Class III | 8 |
| | Class IV | 92 |
| Weight | 30–34 kg | 10 |
| | 35–39 kg | 18 |
| | 40–44 kg | 52 |
| | 45–50 kg | 20 |
| Height | 132–143 cm | 16 |
| | 145–150 cm | 64 |
| | 152–168 cm | 20 |

In this study eight different adverse neonatal outcomes of eclamptic mothers (Table 2) were observed as preterm (40%), LBW (60%), IUGR (12%), birth asphyxia (33%), HIE (8.8%), EOS (9.9%), END (5.5%) and SB (9%). Two clinical parameters of the mothers, that is, diastolic blood pressure of mothers at the time of admission and interval between 1st fits of mothers and delivery of babies and four clinical parameters of the newborns, that is, body weight, gestational age, Apgar score at 1 minute and at 5 minutes were studied as continuous variables.

**Table 2:** Neonatal outcomes of eclamptic mothers

| Serial no | Outcomes | Case (= 100) *n* (%) |
|---|---|---|
| 1 | Preterm | 40 (40%) |
| 2 | LBW | 60 (60%) |
| 3 | IUGR | 12 (12%) |
| 4 | Birth asphyxia # | 30 (33%) |
| 5 | HIE # | 08 (8.8%) |
| 6 | EOS # | 09 (9.9%) |
| 7 | END # | 05 (5.5%) |
| 8 | SB | 09 (9%) |

#Case = 91

Correlation between two continuous variables of mothers with those of newborns was studied by bi-variate analysis (Table 3). It was observed that there is significant negative correlation between maternal DBP (measured at the time of admission) and body weight ($p = 0.001$), gestational age ($p < 0.001$), Apgar score at 1 minute ($p < 0.001$), Apgar score at 5 minutes ($p < 0.001$) of newborns.

**Table 3:** Correlation statistics between maternal and neonatal continuous variables

| Maternalvariable | Neonatal variables | Pearson coeff | *p*-value |
|---|---|---|---|
| DBP on admission | 1 Body Weight | –0.325 | 0.001 |
| | 2 Gestational age | –0.391 | <0.001 |
| | 3 Ap Sc at 1min | –0.370 | <0.001 |
| | 4 Ap Sc at 5min | –0.386 | <0.001 |

DBP <100 or ≥100 mmHg was sorted out as categorical variables for Chi-square test with each neonatal outcome for significance of association (Table 4). It was observed that there was significant correlation between maternal DBP ≥ 100 mmHg on admission and several of the neonatal outcomes like preterm birth (OR = 7.410, 95% CI = 2.707–20.284, $p < 0.001$), LBW (OR = 9.333, 95%CI = 3.697–23.561, $p < 0.001$), birth asphyxia (OR = 8.185, 95% CI = 2.546–26.311, $p < 0.001$). In the statistical calculation of the clinical complications of the neonates like birth asphyxia, HIE, EOS and END the stillborn cases ($n = 09$) were excluded.

**Table 4:** Correlation between maternal categorical variable and neonatal outcomes

| Clinical parameters | Statistics | Preterm | LBW | IUGR | BA | HIE | EOS | SB | END |
|---|---|---|---|---|---|---|---|---|---|
| DBP (mmHg) <100 Or >/ = 100 | OR (C.I. 95%) | 7.410 (2.707–20.284) | 9.333 (3.69–23.561) | 3.800 (0.786–18.370) | 8.185 (2.546–26.311) | 2.298 (0.438–12.063) | 2.739 (0.536–13.993) | 2.509 (0.494–12.754) | 1.080 (0.172–6.799) |
| | *p*-value | <0.001 | <0.001 | 0.149 | <0.001 | 0.528 | 0.370 | 0.433 | 1.000 |

## Discussion

Though hypertension and fits are the two cardinal features of eclampsia , blood pressure may be normal[2,13] or may be minimally elevated[1] in eclampsia. Our study too corroborates to this observation since 38% of DBP of eclamptic mothers measured at the time of admission was ≤ 90 mmHg with the mean of 99.16 mmHg ± S.D. = 13.316.

In our study body weight, gestational age and Apgar scores (at 1 minute and 5 minutes) were found significantly correlated and inversely proportional to the diastolic blood pressure (DBP) of eclamptic mothers as measured at the time of admission. Moreover, our study showed that DBP of eclamptic mothers at the level of ≥ 100 mmHg acted as a significant risk factor the development of neonatal outcomes like preterm birth , LBW, IUGR and birth asphyxia.

Our study is in consonance with the observation of several studies that DBP of eclamptic mothers at and above a certain level acts as significant risk factor for adverse neonatal outcomes. In a similar study of Dhaka Medical College, Alam IL and Akhter S observed that 33% percent of 300 eclamptic mothers in the study having diastolic blood pressure >110 mmHg had 42% perinatal mortality which was statistically significant ($p < 0.01$).[14] In another study in Siddarth Medical College, Karnataka, Dhananjay BS et al. had found 36 out of 72 eclamptic mothers in their study had DBP more than 110 mmHg and perinatal mortality among them was 50%15. Multiple logistic regression analysis of all predisposing risk factors in their study also showed that systolic blood pressure had a significant ($p < 0.05$) influence on perinatal deaths.[15] Yaliwal RG et al. in their study at Shri BM Patil Medical College, Karnataka had shown that 54 out of 98 eclamptic mothers had DBP ≥ 110 mmHg and perinatal death among them was 23 (42.59%).[16]

Our study is comparable to the findings of study done by Bhardwaj A et al. at Netaji Subhas Chandra Bose Medical College, Jabalpur, India which showed maternal hypertension in pregnancy most commonly caused by pre-eclampsia had significant ($p < 0.01$) correlation with adverse neonatal outcomes like low birth weight, decreased gestational age, IUGR, still birth and birth asphyxia.[17]

This study has limitations. Since majority of eclamptic mothers in this study were unbooked and referred from periphery, the status of blood pressure and its treatment, if any, during pre-eclampsia stage could not be reliably documented. Thus this study could not ascertain statistical significance of correlation between neonatral outcomes and the base line blood pressure (during pre-eclampsia) of the eclamptic mothers which

may or may not be modified by treatment to the presenting level as measured in this study.

## Conclusion

In spite of its limitations it can be concluded in this study that early detection and management of hypertension during pre-eclampsia by regular antenatal check-ups to keep diastolic blood pressure at least below 100 mmHg can significantly decrease the incidence of various adverse neonatal outcomes in eclampsia.

### *Key Messages*

Regular antrenatal check-ups with meticulous assessment and strict control of DBP are of utmost importance in reducing incidence of adverse neonatal outcomes of eclampsia.

## References


1. Mammaro A, Carrara S, Cavaliere A, et al. Hypertensive Disorders of Pregnancy. J Prenat Med. Jan 2009;3(1):1–5.
2. Cunningham FG, Leveno KJ, Bloom SL, et al. editors. Williams Obstetrics. 24th ed. McGraw-Hill Professional 2014;729–30.
3. National Heart, Lung, and Blood Institute National High Blood Pressure Education Program. Report of the national high blood pressure education program working group on high blood pressure in pregnancy. American Journal of Obstetrics and Gynecology 2000;183(1):1–22.
4. Pal A, Bhattacharyya R, Adhikari S, et al. Eclampsia-scenario in a hospital: A ten years study. Bangladesh Med Res Counc Bull 2011;37:66–7.
5. Nobis PN, Hajong A. Eclampsia in India Through the Decades. The Journal of Obstetrics and Gynecology of India 2016 Sep;66(1):172–76.
6. Abalos E, Cuesta C, Carroli G, et al. Pre-eclampsia, eclampsia and adverse maternal and perinatal outcomes: A secondary analysis of the World Health Organization Multicountry Survey on Maternal and Newborn Health. BJOG 2014 Mar;121 Suppl 1:14–24.
7. Bell MJ. A Historical Overview of Preeclampsia-Eclampsia. J Obstet Gynecol Neonatal Nurs. 2010 Sep;39(5):510–18.
8. Roberts JM, Gammill HS. Preeclampsia: Recent insights. Hypertension 2005;46:1243–49.
9. Roberts JM, Cooper DW. Pathogenesis and genetics of pre-eclampsia. Lancet. Jan 2001;357(9249):53–6.
10. Kumar N, Shekhar C,. Kumar P, et al. Kuppuswamy's Socioeconomic Status Scale-Updatingfor 2007. The Indian Journal of Pediatric 2007 Dec;74(12):1131–32.
11. Ballard JL, Khoury JC, Wedig K, et al. New Ballard Score, expanded to include extremely premature infants. The Journal of Pediatrics. 1991 Sep;119(3):417–23.
12. Singh M.Care of Newborn. 7th edn. New Delhi: Sagar Publications 2010.p.243.
13. Cipolla MJ, Kraig RP. Seizures in Women with Preeclampsia: Mechanisms and Management. Fetal Matern Med Rev 2011 May;22(02):91–108.
14. Alam IP, Akhter S. Perinatal Outcome of Eclampsia in Dhaka Medical College Hospital. Bangladesh J Obstet Gynaecol 2008;23(1):20–24.
15. Dhananjay BS, Dayananda G, Sendilkumaran D, Murthy N. A Study of Factors Affecting Perinatal Mortality in Eclampsia. JPBS 2009;22(2):2–5.
16. Yaliwal RG, Jaju PB, Vanishre M. Eclampsia and Perinatal Outcome: A Retrospective Study in a Teaching Hospital. Journal of Clinical and Diagnostic Research. 2011;5(5):1056–59.
17. Bhardwaj A, Tiwari M, Bhardwaj VK. Neonatal outcome in hypertensive disorders of pregnancy in a tertiary neonatal unit in central India. Indian Journal of Applied Research 2018 Jun;8(6):74–76.