

MATERNAL AND PERINATAL OUTCOMES IN HYPERTENSIVE DISORDERS OF PREGNANCY: A PROSPECTIVE OBSERVATIONAL STUDY AT A TERTIARY CARE CENTER IN BIHAR

¹Dr Aishwarya Lakshmi Sinha, ²Dr Kumari Ruchika, ³Dr Richa Kumari

¹ Associate Professor, Department of Obstetrics and Gynaecology, M G M Medical College, Kishanganj, Bihar, India.

² Assistant Professor, Department of Obstetrics and Gynaecology, I-care Institute of Medical Sciences, Haldia, West Bengal, India.

³ Assistant Professor, Department of Obstetrics and Gynaecology, M G M Medical College, Kishanganj, Bihar, India.

Corresponding Author: Dr Aishwarya Lakshmi Sinha

Address: Department of Obstetrics and Gynaecology, M G M Medical College, Kishanganj, Bihar, India.

ABSTRACT

Background: Hypertensive disorders of pregnancy (HDP) are among the leading causes of maternal and perinatal morbidity and mortality worldwide, particularly in low- and middle-income countries. These disorders are associated with a wide spectrum of complications affecting both mother and fetus.

Objectives: To assess maternal and perinatal outcomes among women with hypertensive disorders of pregnancy and to evaluate the association between disease severity and adverse outcomes.

Methods: A prospective observational study was conducted in a tertiary care hospital in Bihar from August 2022 to March 2023. A total of 258 pregnant women diagnosed with HDP were enrolled using consecutive sampling. Data were collected using a structured proforma, including sociodemographic details, clinical features, laboratory parameters, and outcomes. Maternal outcomes included mode of delivery, complications, ICU admission, and mortality. Perinatal outcomes included birth weight, gestational age, APGAR score, NICU admission, and perinatal mortality. Statistical analysis was performed using SPSS version 22.0, and a p-value <0.05 was considered significant.

Results: The majority of participants were aged 20–29 years and primigravida. Preeclampsia was the most common hypertensive disorder. Maternal complications were observed in 26.4% of cases, with 8.5% requiring ICU admission and a maternal mortality rate of 1.6%. Perinatal outcomes showed that 45.7% of neonates had low birth weight, 37.2% were preterm, and 28.7% required NICU admission. Perinatal mortality was 7.0%. A significant association was found between the severity of HDP and adverse perinatal outcomes, with higher rates of low birth weight, preterm birth, and NICU admission in severe cases (p <0.001).

Conclusion: Hypertensive disorders of pregnancy are associated with significant maternal and perinatal morbidity, especially in severe forms. Early diagnosis, adequate antenatal care, and timely management are essential to improve outcomes.

Keywords: Hypertensive disorders of pregnancy; Preeclampsia; Maternal outcomes; Perinatal outcomes; NICU admission; Preterm birth

INTRODUCTION

Maternal health remains a critical public health priority worldwide, with hypertensive disorders of pregnancy (HDP) constituting one of the leading causes of maternal and perinatal morbidity and mortality. Globally, HDP complicates approximately 5–10% of all pregnancies and contributes significantly to adverse outcomes including preterm birth, intrauterine growth restriction, placental abruption, and perinatal death [1]. The spectrum of HDP includes gestational hypertension, preeclampsia, eclampsia, and chronic hypertension with superimposed preeclampsia, each associated with varying degrees of maternal and fetal risk [2]. Despite advances in obstetric care, these conditions continue to pose substantial challenges, particularly in low- and middle-income countries.

In developing regions, including South Asia, the burden of HDP is disproportionately high due to delayed diagnosis, inadequate antenatal care, and limited access to emergency obstetric services [3]. India, accounting for a significant share of global maternal deaths, reports hypertensive disorders as the second most common direct cause of maternal mortality after hemorrhage [4]. Furthermore, perinatal outcomes in pregnancies complicated by hypertension are often compromised, with increased rates of low birth weight, preterm delivery, and neonatal intensive care admissions [5].

The pathophysiology of preeclampsia, a major component of HDP, involves abnormal placentation, endothelial dysfunction, and systemic inflammatory responses, leading to multi-organ involvement [6]. Early identification and timely management are crucial to mitigate complications; however, the clinical course is often unpredictable. The severity of hypertension and associated complications such as HELLP syndrome, eclampsia, and acute renal failure further exacerbate maternal risk [7]. From a perinatal perspective, uteroplacental insufficiency contributes to fetal hypoxia and growth restriction, thereby increasing neonatal morbidity and mortality [8].

In the Indian context, tertiary care hospitals frequently receive referrals of high-risk pregnancies, including complicated cases of HDP, which may not have been adequately managed at peripheral centers. This referral bias often results in a higher observed burden of adverse outcomes in such settings [9]. Additionally, variations in sociodemographic factors, healthcare-seeking behavior, and resource availability influence both maternal and perinatal outcomes, highlighting the need for region-specific data.

Although several studies have evaluated HDP and its outcomes, there remains a paucity of prospective observational data from Bihar tertiary care centers that comprehensively assess both maternal and perinatal outcomes within a defined cohort. Most existing studies are either retrospective or limited in scope, thereby restricting causal inferences and temporal associations. Furthermore, evolving clinical practices and improvements in antenatal and intrapartum care necessitate updated evidence to guide management strategies.

In this context, the present study was undertaken to prospectively evaluate maternal and perinatal outcomes among women diagnosed with hypertensive disorders of pregnancy in a tertiary care hospital in Bihar. The primary objective was to assess the spectrum of maternal complications and perinatal outcomes associated with HDP, while also identifying key clinical patterns that may inform early intervention and improved obstetric care.

METHODOLOGY

Study Design: This study was designed as a prospective observational hospital-based study.

Study Setting: The study was conducted in the Department of Obstetrics and Gynecology at a tertiary care teaching hospital in Bihar, which serves as a referral center for high-risk pregnancies from urban and rural areas.

Study Duration: The study was carried out over a period of eight months, from August 2022 to March 2023.

Study Population: The study population comprised all pregnant women diagnosed with hypertensive disorders of pregnancy (HDP) who were admitted to the obstetrics department during the study period.

Inclusion Criteria

- Pregnant women diagnosed with hypertensive disorders of pregnancy, including:
 - Gestational hypertension
 - Preeclampsia
 - Eclampsia
 - Chronic hypertension with superimposed preeclampsia
- Singleton pregnancies
- Women willing to provide informed consent

Exclusion Criteria

- Pregnant women with pre-existing systemic illnesses such as:
 - Chronic renal disease
 - Pre-existing cardiac disease
 - Autoimmune disorders
- Multiple pregnancies (twins or higher order gestations)
- Women unwilling to participate or not providing consent

Sample Size: The sample size was calculated using the formula for estimating a proportion in a descriptive study:

$$n = \frac{Z^2 \times p \times q}{d^2}$$

Where:

- ($Z = 1.96$) (standard normal deviate at 95% confidence level)
- ($p = 0.10$) (expected prevalence of hypertensive disorders in pregnancy taken as 10% based on previous literature)
- ($q = 1 - p = 0.90$)
- ($d = 0.04$) (absolute precision)

The calculated sample size was approximately 216. Considering possible attrition and incomplete data, a final sample size of 258 participants was included in the study.

Sampling Technique: A consecutive sampling technique was employed, wherein all eligible pregnant women meeting the inclusion criteria during the study period were enrolled until the required sample size was achieved.

Data Collection Tools & Procedure: Data were collected using a pre-designed, pre-tested structured proforma. Upon admission, eligible participants were identified and informed consent was obtained. Detailed history including sociodemographic profile, obstetric history, and clinical

presentation was recorded. Clinical examination findings, blood pressure measurements, and relevant laboratory investigations (such as urine protein, liver function tests, renal function tests, and platelet count) were documented. Participants were followed throughout their hospital stay until delivery and early postpartum period. Maternal outcomes (e.g., mode of delivery, complications such as eclampsia, HELLP syndrome, postpartum hemorrhage) and perinatal outcomes (e.g., birth weight, gestational age at delivery, APGAR score, NICU admission, perinatal mortality) were recorded.

Study Variables: Independent variables included maternal age, parity, gestational age at diagnosis, type and severity of hypertensive disorder, antenatal care status, and associated risk factors. Dependent variables comprised maternal outcomes (mode of delivery, maternal complications, ICU admission, maternal mortality) and perinatal outcomes (birth weight, preterm birth, APGAR score, NICU admission, stillbirth, and early neonatal death).

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 22.0. Descriptive statistics were expressed as frequencies, percentages, means, and standard deviations. Inferential statistics were applied using the Chi-square test or Fisher's exact test for categorical variables and Student's t-test for continuous variables, as appropriate. A p-value of <0.05 was considered statistically significant.

Ethical Considerations: Written informed consent was obtained from all participants prior to enrollment. Confidentiality and anonymity of participants were strictly maintained. The study adhered to the ethical principles outlined in the Declaration of Helsinki for research involving human subjects.

RESULTS

A total of 258 pregnant women with hypertensive disorders of pregnancy were included in the study. The majority of participants were aged 20–29 years (60.5%), primigravida (57.4%), and from rural areas (62.8%). Approximately one-third (34.1%) of the women were unbooked cases, and 39.5% presented at term gestation (Table 1).

Table 1: Sociodemographic and Obstetric Characteristics of Study Participants (n = 258)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	<20	28	10.9
	20–29	156	60.5
	≥30	74	28.6
Parity	Primigravida	148	57.4
	Multigravida	110	42.6
Residence	Rural	162	62.8
	Urban	96	37.2
Antenatal Care	Booked	170	65.9
	Unbooked	88	34.1
Gestational Age at Admission	<34 weeks	64	24.8
	34–37 weeks	92	35.7
	>37 weeks	102	39.5

Preeclampsia constituted the largest proportion of hypertensive disorders, with mild and severe forms accounting for 37.2% and 20.9% of cases, respectively. Gestational hypertension was observed in 27.9% of participants, while eclampsia and chronic hypertension with superimposed preeclampsia were less common (Table 2).

Table 2: Distribution of Types of Hypertensive Disorders of Pregnancy (n = 258)

Type of HDP	Frequency (n)	Percentage (%)
Gestational Hypertension	72	27.9
Preeclampsia (Mild)	96	37.2
Preeclampsia (Severe)	54	20.9
Eclampsia	24	9.3
Chronic Hypertension with Superimposed Preeclampsia	12	4.7

Regarding maternal outcomes, 55.0% of women delivered vaginally, while 45.0% underwent cesarean section. Maternal complications were observed in 26.4% of cases. ICU admission was required in 8.5% of participants, and the maternal mortality rate was 1.6% (Table 3).

Table 3: Maternal Outcomes among Study Participants (n = 258)

Outcome	Category	Frequency (n)	Percentage (%)
Mode of Delivery	Vaginal	142	55.0

	Cesarean Section	116	45.0
Maternal Complications*	Present	68	26.4
	Absent	190	73.6
ICU Admission	Yes	22	8.5
	No	236	91.5
Maternal Mortality	Yes	4	1.6
	No	254	98.4

*Includes eclampsia, HELLP syndrome, postpartum hemorrhage, acute renal failure.

Perinatal outcomes revealed that 45.7% of neonates had low birth weight, and 37.2% were delivered preterm. An APGAR score of less than 7 at 5 minutes was noted in 20.2% of neonates. NICU admission was required in 28.7% of cases, and the perinatal mortality rate was 7.0% (Table 4).

Table 4: Perinatal Outcomes (n = 258)

Outcome	Category	Frequency (n)	Percentage (%)
Birth Weight	<2.5 kg	118	45.7
	≥2.5 kg	140	54.3
Preterm Birth	Yes	96	37.2
	No	162	62.8
APGAR Score (5 min)	<7	52	20.2
	≥7	206	79.8
NICU Admission	Yes	74	28.7
	No	184	71.3
Perinatal Mortality	Yes	18	7.0
	No	240	93.0

A statistically significant association was observed between the severity of hypertensive disorders and adverse perinatal outcomes. Women with severe preeclampsia or eclampsia had significantly higher rates of low birth weight, preterm birth, and NICU admission compared to those with mild disease ($p < 0.001$) (Table 5).

Table 5: Association between Severity of HDP and Adverse Perinatal Outcomes

Severity of HDP	Low Birth Weight n (%)	Preterm Birth n (%)	NICU Admission n (%)	p-value
Mild (n=168)	58 (34.5)	46 (27.4)	34 (20.2)	<0.001
Severe/Eclampsia (n=90)	60 (66.7)	50 (55.6)	40 (44.4)	

DISCUSSION

The present prospective observational study evaluated maternal and perinatal outcomes among women with hypertensive disorders of pregnancy (HDP) in a tertiary care setting in Bihar. The findings demonstrated that HDP continues to be associated with substantial maternal morbidity and adverse perinatal outcomes, particularly in cases of severe preeclampsia and eclampsia.

In this study, the majority of women were in the 20–29 years age group and primigravida, which is consistent with previous literature indicating that younger maternal age and first pregnancy are significant risk factors for preeclampsia [1,6,10]. The higher proportion of rural participants and unbooked cases reflects disparities in access to antenatal care, which has been shown to contribute to delayed diagnosis and worse outcomes in HDP [3,4].

Preeclampsia (both mild and severe) constituted the majority of cases, aligning with global and Indian data where preeclampsia remains the most common hypertensive disorder in pregnancy [2],[9]. The proportion of severe cases and eclampsia observed in this study underscores the referral nature of tertiary care centers, where complicated and advanced cases are more likely to be managed. Similar patterns have been reported in hospital-based studies in developing countries [3]. The cesarean section rate of 45% in this study is comparable to other studies involving high-risk pregnancies complicated by HDP. Increased operative delivery rates are often attributed to fetal distress, failed induction, and the need for timely termination of pregnancy in severe disease [7]. Maternal complications were observed in approximately one-fourth of cases, including eclampsia, HELLP syndrome, and postpartum hemorrhage, which is consistent with the known multisystem involvement of severe hypertensive disorders [6,7,10]. The ICU admission rate (8.5%) and maternal mortality (1.6%) further highlight the severity of HDP in this cohort. These findings are in line with reports from similar tertiary care settings, where maternal mortality due to HDP remains a concern despite advances in critical care [4,11].

Perinatal outcomes in the present study were notably affected, with a high prevalence of low birth weight (45.7%) and preterm birth (37.2%). These findings are consistent with the pathophysiological basis of uteroplacental insufficiency associated with HDP, leading to impaired fetal growth and early delivery [8],[10]. The rates of NICU admission (28.7%) and low APGAR scores also reflect the compromised neonatal condition at birth. Comparable findings have been reported in previous studies, where HDP was associated with increased neonatal morbidity and need for intensive care [5,11].

A key finding of this study was the statistically significant association between the severity of HDP and adverse perinatal outcomes. Women with severe preeclampsia and eclampsia had markedly higher rates of low birth weight, preterm delivery, and NICU admissions. This observation is supported by existing evidence suggesting that disease severity is directly proportional to the risk of adverse outcomes [5,7,10]. The underlying mechanisms include severe placental insufficiency, fetal hypoxia, and the necessity for early delivery to prevent maternal complications.

From a clinical and public health perspective, these findings emphasize the importance of early detection, regular antenatal monitoring, and timely referral of high-risk pregnancies. Strengthening primary healthcare systems to ensure adequate antenatal coverage, especially in rural areas, could significantly reduce the burden of severe HDP. Additionally, standardized protocols for the management of preeclampsia and eclampsia, along with improved critical care facilities, are essential to improve maternal and neonatal outcomes [11].

The strengths of this study include its prospective design, which allowed for systematic data collection and temporal assessment of outcomes, and the inclusion of both maternal and perinatal

parameters, providing a comprehensive evaluation of HDP. However, certain limitations should be acknowledged. Being a single-center study, the findings may not be generalizable to the broader population. The hospital-based setting, particularly a tertiary referral center, may have led to an overrepresentation of severe cases (referral bias). Additionally, long-term maternal and neonatal outcomes were not assessed, which could provide further insights into the burden of HDP.

CONCLUSION

Hypertensive disorders of pregnancy remain a significant contributor to maternal and perinatal morbidity in tertiary care settings. The present study demonstrates that a substantial proportion of women with HDP experience adverse outcomes, particularly those with severe preeclampsia and eclampsia. Maternal complications, increased rates of cesarean delivery, and the need for intensive care highlight the clinical burden of the disease. Perinatal outcomes were also notably affected, with high incidences of low birth weight, preterm birth, NICU admissions, and perinatal mortality. The findings underscore the importance of early identification, adequate antenatal care, and timely referral to higher centers for optimal management. Strengthening peripheral healthcare services and ensuring routine screening for hypertension during pregnancy can facilitate early diagnosis and intervention. Implementation of standardized management protocols and improving critical care facilities can further reduce adverse outcomes. Future research focusing on long-term maternal and neonatal outcomes is recommended to better understand the full spectrum of HDP-related complications.

DECLARATIONS

Funding: None.

Conflict of Interest: The authors declare no conflict of interest.

Consent: Written informed consent was obtained from all participants prior to inclusion in the study.

Acknowledgment: The authors acknowledge the support of the Department of Obstetrics and Gynecology and all participants involved in the study.

REFERENCES

1. WHO. World Health Organization. WHO recommendations for prevention and treatment of pre-eclampsia and eclampsia. Geneva: World Health Organization. 2011.
2. Obstetricians ACOG. Hypertension in pregnancy. Report of the American College of Obstetricians and Gynecologists' task force on hypertension in pregnancy. *Obstet gynecol.* 2013;122(5):1122.
3. Duley L. The global impact of pre-eclampsia and eclampsia. In *Seminars in perinatology* 2009 Jun 1 (Vol. 33, No. 3, pp. 130-137). WB Saunders.
4. Registrar General of India. Special bulletin on maternal mortality in India 2016–18. New Delhi: Office of the Registrar General, India; 2020.
5. Barbosa IR, Silva WB, Cerqueira GS, Novo NF, Almeida FA, Novo JL. Maternal and fetal outcome in women with hypertensive disorders of pregnancy: the impact of prenatal care. *Therapeutic advances in cardiovascular disease.* 2015 Aug;9(4):140-6.
6. Redman CW, Sargent IL. Placental stress and pre-eclampsia: a revised view. *Placenta.* 2009 Mar 1;30:38-42.
7. Sibai BM. Diagnosis and management of gestational hypertension and preeclampsia. *Obstetrics & Gynecology.* 2003 Jul 1;102(1):181-92.
8. Roberts JM, Hubel CA. The two stage model of preeclampsia: variations on the theme. *Placenta.* 2009 Mar 1;30:32-7.
9. Kumar M, Sharma K, Singh S, Singh R, Singh A, Bhattacharjee J. Use of first-trimester placenta growth factor concentration to predict hypertensive disorders of pregnancy in a low-risk Asian population. *International Journal of Gynecology & Obstetrics.* 2017 Dec;139(3):301-6.
10. Steegers EA, et al. Pre-eclampsia. *Lancet.* 2010;376(9741):631–44.
11. Von Dadelszen P, Magee LA. Preventing deaths due to the hypertensive disorders of pregnancy. *Best practice & research Clinical obstetrics & gynaecology.* 2016 Oct 1;36:83-102.