



## Original Research Article

## Neonatal outcome in hypertensive disorders of pregnancy in tertiary care centre

Supriya Mohanty<sup>1</sup>, Madhusmita Pradhan<sup>2</sup>, Jyoti Ranjan Champatiray<sup>1</sup>, Sristi Ganguly<sup>1,\*</sup><sup>1</sup>Dept. of Paediatrics, SVPPGIP & SCBMCH, Cuttack, Odisha, India<sup>2</sup>Dept. of Obstetrics and Gynecology, Bhima Bhoi Medical College & Hospital, Balangir, Odisha, India

## ARTICLE INFO

## Article history:

Received 20-01-2021

Accepted 11-05-2021

Available online 30-04-2022

## Keywords:

Hypertensive disorders

Hypoxic Ischemic Encephalopathy

(HIE)

## ABSTRACT

**Background:** Hypertensive disorders of pregnancy, contribute to significant neonatal mortality and morbidity, with complications ranging from prematurity, low birth weight and respiratory morbidities.

**Materials and Methods:** This study is a observational study done in tertiary care hospital in Cuttack, Odisha during the period December 2018 to November 2020. Mothers, aged 18 to 36 years, beyond 20 weeks of pregnancy with hypertensive disorders complicating pregnancy admitted, with booked pregnancy and regular antenatal check-up were included in the study. Those with underlying chronic diseases like chronic diabetes mellitus, chronic renal failure, chronic hypertension, heart disease, twin or multiple pregnancy and polyhydramnios were excluded. The neonates born followed and outcomes noted. Data analysed using SPSS 26 and results expressed in percentage and comparison across the groups done using Chi Square test / Fisher's Exact Test as appropriate.

**Results:** Among 150 mothers, majority were suffering from severe preeclampsia (36%) followed by gestational hypertension (27.3%), with most (66.7%) being a term pregnancy. 20.9% were stillbirths and 34% needed NICU admission for various complications. The most common neonatal complication noted was intrauterine growth retardation. A significant association noted between the severity of hypertension and maturity ( $p < 0.001$ ), birth weight ( $p = 0.001$ ), delivery outcome ( $p = 0.001$ ) and neonatal complications ( $p = 0.009$ ).

**Conclusion:** The delivery outcome, gestational age and birth weight, along with neonatal complications had a significant association with increasing severity of the hypertension. Thus, there is urgent necessity for strict protocols to screen, early detection and efficient management of these disorders in pregnant women, in order to ensure a safe outcome for both mother and newborn.

This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: [reprint@ipinnovative.com](mailto:reprint@ipinnovative.com)

## 1. Introduction

Among the various diseases in the mother that take a significant toll on the newborn, be it in terms of morbidity or mortality, hypertensive disorders complicating pregnancy form one of the deadly triads, along with hemorrhage and infection.<sup>1</sup>

The impact of pregnancy induced hypertension (PIH) on fetal growth is complex.<sup>2</sup> PIH has been confirmed to increase significantly the risk of low birth weight by both increasing preterm birth as well as reducing fetal growth. On the other hand, PIH has been found to be associated with an increased rate of high birth weight and large-for-gestational age babies.<sup>3</sup> These findings suggest that PIH, more specifically preeclampsia, is a heterogeneous syndrome and that preeclampsia may appear in two forms: restricted fetal growth preeclampsia and normal fetal growth

\* Corresponding author.

E-mail address: [sristig92@gmail.com](mailto:sristig92@gmail.com) (S. Ganguly).

preeclampsia.

The offspring of women with hypertension, especially severe preeclampsia, experience certain medical problems like respiratory distress syndrome, transient tachypnea of newborn, persistent pulmonary hypertension, and respiratory failure, observed in late preterm neonates.<sup>4</sup>

In India, preeclampsia continues to be responsible for the largest proportion of perinatal deaths resulting from prematurity and Intrauterine Growth Restriction (IUGR) and is a major contributor to perinatal morbidity also. The perinatal mortality ranges from 14.6% to 47.4%.<sup>5</sup>

However, there is still paucity of literature regarding the detailed neonatal outcomes of babies whose mothers suffered from such hypertensive disorders of pregnancy, in a developing state like Odisha, where neonatal mortality is still high. Detailed insight into this matter will help in guiding the health care facilities and government to make necessary changes in the protocols, which in turn will improve antenatal care, early diagnosis and treatment of preeclampsia and its outcomes, to ensure a better future for both mother and baby, in the times to come.

The present study is undertaken to analyze the cases of pregnancy complicated by hypertensive disorders, consequences in relation to preterm delivery, IUGR, stillbirth, early neonatal death, and Neonatal Intensive Care Unit (NICU) admission for various gastrointestinal, nervous system and respiratory morbidities.

## 2. Materials and Methods

The present study is an observational study done in postnatal ward and SNCU of a tertiary care hospital in Cuttack, Odisha during the period December 2018 to November 2020. Mothers, aged 18 to 36 years, beyond 20 weeks of pregnancy with hypertensive disorders complicating pregnancy admitted, with booked pregnancy and regular antenatal check-up were included in the study. Those with underlying chronic diseases like chronic diabetes mellitus, chronic renal failure, chronic hypertension, heart disease, twin or multiple pregnancy and polyhydramnios were excluded.

## 3. Aims and Objectives

Study of consequences and situations of hypertensive disorders of pregnancy in relation to :-

1. Preterm delivery
2. Low birth weight
3. Intra uterine growth restriction
4. Stillbirth
5. NICU admission due to various neurological (birth asphyxia), gastrointestinal (Necrotising enterocolitis), and respiratory morbidities -Respiratory Distress Syndrome (RDS), Meconium Aspiration Syndrome (MAS).

After obtaining ethical committee approval and informed consent from parents, detailed history was taken from the attendants and newborns were examined, giving particular importance to obstetric history, gestational age, birth weight and neonatal outcome.

In all cases following investigation values were noted: Complete blood count, Serum urea and creatinine, Liver function tests, Urine for albumin, sugar and microscopy, Blood group and Rh type.

All the babies were followed up during early neonatal period for any complications. Modified New Ballard scoring was applied to calculate the gestational age. Premature babies were monitored to see for respiratory distress, if diagnosed then severity grading was done using Downes score and Silverman and Anderson score. Apgar scoring was done at 1 minute and 5 minute in all babies. In babies with birth asphyxia, Sarnat and Sarnat scoring was done to classify them into Hypoxic Ischemic Encephalopathy (HIE)- I/II/III, in order to predict the neurological outcome.

Statistical methods applied in this study: The statistical software SPSS version 20 has been used for the analysis.

Categorical variables are expressed as number of patients and percentage of patients, the distribution is compared using Frequency Chi square Tests. Comparison across the groups is done using Pearson's Chi Square test for Independence of Attributes/ Fisher's Exact Test as appropriate. Continuous variables are expressed as Minimum, Maximum, Mean, Median and Standard Deviation. An alpha level of 5% has been taken, i.e. if any p value is less than 0.05 it has been considered as significant.

## 4. Results

In our study, total of 150 mothers with pregnancy induced hypertension were enrolled and majority were suffering from severe preeclampsia (36%) followed by gestational hypertension (27.3%)[Figure 1]. The mean age of mothers in the study was 23.82 years (+3.43) and more than half were multipara (56%).[Table 1] The mean period of gestation was 36.65 + 2.26 with most (66.7%) being a term pregnancy. 101 cases (67.3%) had diastolic blood pressure in range of 90-100mmHg and 112 cases (74.7%) had systolic blood pressure in range of 140-160 mmHg. Severe proteinuria (dip stick urine albumin more than or equal to 3+) was seen in 35 mothers (23.3%). Table 2 shows the sex, weight and maturity profile of the newborns born to the mothers with hypertensive disorders in pregnancy along with their APGAR scores. Further, 20.9% (31) were stillbirths and 51 babies (34%) needed NICU admission for various complications. The most common neonatal complication noted was intrauterine growth retardation (IUGR), including babies with only IUGR, IUGR-Hypoxia, IUGR-Respiratory Distress Syndrome and IUGR-Meconium Aspiration Syndrome.[Figure 2].

On assessing the relation between the various hypertensive disorders in pregnancy and maturity of neonate, a significant association was established ( $p < 0.001$ ). Similar significant association was also seen between the severity of hypertension in pregnancy and delivery outcome ( $p = 0.001$ ) and neonatal complications ( $p = 0.009$ ). Severity of hypertension also showed significant relation with lower birth weight ( $p = 0.001$ ).

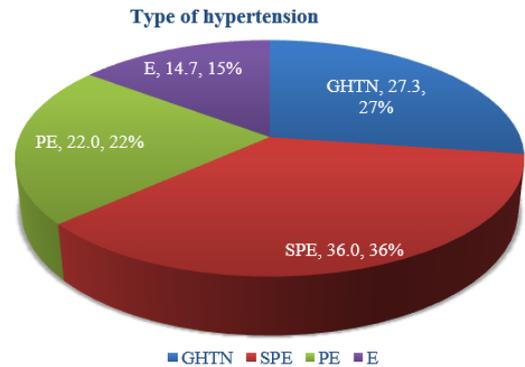
Decreased still birth and early neonatal deaths with multiparity, term gestation, cesarean delivery in hypertensive mothers were other findings worth mentioning.

**Table 1:** Characteristics of the antenatal women with hypertensive disorder of pregnancy

Age of mother (in years)	Frequency	Percentage (n=150)
18-21	44	29.3
22-25	73	48.7
26-29	19	12.7
30-33	11	7.3
34-37	3	2.0
Socioeconomic status		
Lower	114	76.0
Middle	36	24.0
Parity		
Primigravida	66	44.0
Multigravida	84	56.0
Period of gestation (in weeks)		
28-31	6	4.0
32-33	8	5.3
34-36	36	24.0
>=37	100	66.7
Systolic blood pressure in mm hg		
140-160	112	74.7
>160	38	25.3
Diastolic blood pressure in mm hg		
90-100	101	67.3
101-110	27	18.0
111-150	21	14.0
>150	1	0.7
Urine Albumin		
Nil	33	22.0
Trace	7	4.7
1+	20	13.3
2+	55	36.7
3+	33	22.0
5.0	2	1.3
Platelet Count		
Normal	141	94.0
Decreased	9	6.0
Mode of delivery		
Vaginal	76	50.7
Caesarean	74	49.3

**Table 2:** Characteristics of the neonates in the study population

Sex	Number of cases	Percentage (n=150)
Male	80	53.3
Female	70	46.7
<b>APGAR score at 1 minute</b> (n=128)		
0-3	7	5.5
4-6	27	21.1
7-10	94	73.4
<b>APGAR score at 5 minutes</b> (n=129)		
0-3	1	0.8
4-6	7	5.4
7-10	121	89.1
<b>Birth weight (in kg)</b> (n=150)		
<1	2	1.3
1-1.5	20	13.3
1.5-2	19	12.7
2-2.5	37	24.7
2.5-3	41	27.3
3-3.5	24	16.0
3.5-4	7	4.7
<b>Maturity</b> (n=150)		
Term	100	66.7
Pre Term	50	33.3

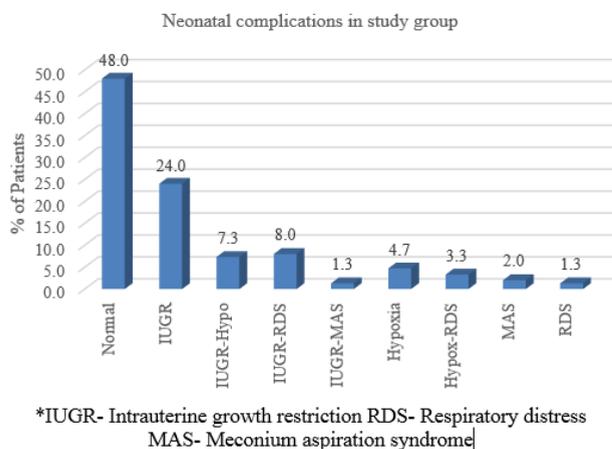


\*GHTN- Gestational hypertension PE- Preeclampsia E- Eclampsia

**Fig. 1:** Hypertensive disorders complicating pregnancy in study population

### 5. Discussion

In our study maximum number of babies were in the range of 2.5-3 kg, accounting for 41 cases (27.3%), followed by 37 cases (24.7%) in the range of 2-2.5 kg and only 1.3% cases were below 1 kg. 52% of babies had birth weight less than 2.5kg. Comparable results were obtained in the study conducted by Patel R et al,<sup>6</sup> where 53.12% of babies were low birth weight. Similar results were obtained in the study conducted by Parmar MR et al,<sup>7</sup> 53% of babies were low birth weight and 47% of babies were more than or equal



**Fig. 2:** Complications seen in neonates born to mothers with hypertensive disorders

to 2.5 kg. The study done by Vats K et al<sup>8</sup> further showed 25.5% of babies were in the range of 1.5-2.5kg and 6% of babies were < 1.5kg.

Majority of the babies were born at term, accounting for 100 cases (66.7%) and 50 babies were preterm (33.3%). Majority were term neonates, as in our study all the mothers were booked cases with regular antenatal check-up. High rates of preterm termination of pregnancy for foeto-maternal sake in hypertensive mothers result in preterm babies. This was in line with the results noted by Bangal VB et al,<sup>9</sup> where 37% of babies were preterm.

Other studies done by Yadav et al<sup>10</sup> and Vats K et al,<sup>8</sup> revealed a slightly lower incidence of preterm births i.e. 28.8% and 26.5% respectively. On the other hand, higher incidence of prematurity was seen in studies done by Tiwari A et al,<sup>11</sup> and J Nadkarni et al<sup>12</sup> accounting for 44.2% and 44.3% respectively. This difference in prematurity can be attributed to the severity of hypertension in the mothers and also, the expertise and judgement of the gynaecologists varying from centre to centre.

48% of the babies in the present study, had no adverse perinatal outcome. Most common complication noted was intra uterine growth retardation (40.6%), occurring either solely or in association with hypoxia, respiratory distress, or meconium aspiration. Hypoxia, MAS, RDS, and hypoxia occurring in conjunction with RDS accounted for 4.7%, 2%, 1.3%, and 3.3% respectively.

Pregnancies complicated by intrauterine growth restriction (IUGR), defined as a pathological process of reduced fetal growth, have been associated with increase in perinatal mortality.<sup>10,13</sup> A high incidence of IUGR/SGA infants in women who have pre-eclampsia has been reported, ranging from 15% to more than 50%.<sup>14,15</sup> Intrauterine growth retardation was seen in 32.6% in the study conducted by Gupta BK et al.<sup>16</sup>

In fact, a study by Kolluru V et al<sup>17</sup> revealed IUGR as the commonest complication totalling up to 78 cases (33.4%) which is comparable to the study by Bangal VB et al,<sup>9</sup> in which the incidence of IUGR was 20%, followed by prematurity seen in 31.6% cases, hypoxia in 10.2% cases, RDS seen in 2.9% cases, and MAS seen in 2.1% cases.

In our study, 34% babies required NICU admission for various complications, out of which most common being intra uterine growth retardation and its related outcomes. Siromani SM et al,<sup>17</sup> in their study on neonatal outcome in PIH mothers showed 34.25% babies born to PIH group needed NICU care for various adverse fetal outcome, which is almost similar to our study.

The perinatal mortality in our study is comparable with studies done by Goswami P et al<sup>18</sup> (25%), George JN et al<sup>19</sup> (29%), Kiondo P et al<sup>20</sup> (22%), and Kolluru V et al<sup>17</sup> (23%). Gandhi MR et al,<sup>21</sup> in their study on 95 hypertensive mothers showed that 73 babies (76.8%) were born alive whereas 22 babies (23.2%) had fatal outcome.

Hypertensive disorders in pregnancy encompass a wide spectrum ranging from gestational hypertension to eclampsia, in increasing severity. The severity of hypertension influences the neonatal outcome, in terms of gestation or birth weight or survival.

Eclampsia was responsible for maximum number of preterm deliveries (68.18%) followed by severe pre-eclampsia (40.74%), which is statistically highly significant. This indicates that the severity of the disease is directly related to the prematurity of the baby. Such a significant association was also established in studies done by Kolluru V et al<sup>17</sup> and Bangal VB et al.<sup>9</sup> Often, preterm delivery was due to early spontaneous labour or because of therapeutic induction necessitated by severe PIH.

Low birth weight babies were more in eclampsia group i.e., 90.91%, followed by 64.82% in severe preeclampsia group, 36.37% in preeclampsia group, and least were in gestational hypertension group i.e., 26.83%. With increasing severity of PIH, there is further compromise of uteroplacental blood flow leading to early spontaneous labour or therapeutic induction necessitated by severe PIH. Comparable results were obtained in the study done by Tiwari A et al,<sup>11</sup> the low birth weight rate was maximum in eclampsia group i.e., 88%, followed by 62% in preeclampsia group, and 41.4% in gestational hypertension group.

On comparing the mortality rate in different groups, maximum death (36.36%) was seen in eclampsia group followed by 35.19% death in severe preeclampsia group, this finding was statistically significant. The study by Gandhi MR et al,<sup>21</sup> further supports our study, with perinatal mortality in eclampsia group being 63.64%, in severe preeclampsia group was 47.83%, and in preeclampsia group was 6.56%. Tiwari A et al,<sup>11</sup> in their study concluded that perinatal death in gestational hypertension group was 4.2%, in preeclampsia group was 16.46%, and in eclampsia

group was 52%.

In above studies also maximum perinatal death was attributed to eclampsia, but a slightly lower incidence in our study is probably because all the cases were booked, with regular antenatal check-up and all were institutional delivery with early and aggressive post-delivery care for various neonatal complications.

The most common neonatal complication was intra uterine growth retardation, either occurring solely or in association with hypoxia, MAS, or RDS accounting for 40.7%. Incidence of IUGR was 63.64% in eclampsia group, 53.7% occurring in severe preeclampsia group, 30.3% occurring in preeclampsia group and 19.5% in gestational hypertension group, that is statistically significant. In hypertensive disorder of pregnancy, the growth retardation of the fetus occurs due to decreased uteroplacental blood flow, severity increases with increase in severity of hypertensive disease. A significant association was noted between the neonatal complications and severity of hypertension ( $p=0.009$ ).

Likewise, in the study by Bengal VB et al,<sup>9</sup> IUGR was the second most common complication seen in 3 (7.69%) cases of mild PIH, 11 (26.19%) cases of severe PIH and 6 (31.58%) cases of eclampsia. Moreover, Tiwari A et al,<sup>11</sup> in their study also concluded a similar association between growth restricted babies with the severity of hypertension in pregnancy.

Thus, hypertension in pregnancy, owing to its great adverse impact requires diagnosis at a premature stage, such that early identification of women at risk and urgent interventions, which prevent deterioration of the severity can be implemented such that the impact on the neonate is negligible.

## 6. Conclusion

Pregnancies complicated with hypertension are associated with adverse perinatal outcome in terms of prevalence of intrauterine growth restriction, prematurity, low birth weight, early neonatal death, high rates of admission to NICU and the need for resuscitation. The outcome of delivery, gestational maturity and birth weight, along with neonatal outcomes had a significant association with increasing severity of the hypertension. Thus, there is great need for vigilant protocols to screen, early detection and strict management of these disorders in antenatal women, in order to ensure a healthy outcome for both mother and baby.

## 7. Conflict of Interest

The authors declare that there is no conflict of interest.

## 8. Source of Funding

None.

## References

- Cunningham FG, Gant NF, Leveno KJ, Larry C. Williams Obstetrics, 21st Edn. In: Hypertensive disorder in pregnancy. McGraw Hill Medical Publishing Division; p. 567–618. doi:10.1016/S1526-9523(03)00291-5.
- Xiong X, Fraser WD. Impact of pregnancy-induced hypertension on birthweight by gestation age. *Paediatr Perinat Epidemiol.* 2004;18(3):186–91. doi:10.1111/j.1365-3016.2004.00553.x.
- Xiong X, Demianczuk NN, Buekens P, Saunders LD. Association of preeclampsia with high birth weight for age. *Am J Obstet Gynecol.* 2000;183(1):148–55. doi:10.1067/mob.2000.105735.
- Dudell GG, Jain L. Hypoxic respiratory failure in the late preterm infant. *Clin Perinatol.* 2006;33(4):803–30.
- Nermeen YV, Ghamande S, Ingle KM. A five year analysis of eclampsia. *J Obstet Gynaecol Ind.* 1989;39:513–8.
- Patel R. A study on pregnancy induced hypertension and foetal outcome among patient with PIH at tertiary care hospital, Valsad. *Int J Community Med Public Health.* 2017;4(11):4277–81.
- Parmar MR. Effect of pregnancy induced hypertension on maternal and perinatal outcome at tertiary care centre. *Int J Reprod Contracept Obstet Gynecol.* 2017;6(10):4661–5.
- Vats K. Study of fetal outcome in hypertensive disorders of pregnancy in a tertiary care maternity hospital of Delhi. *Int J Rep Contracept Obstet Gynecol.* 2016;5(11):3773–7.
- Bangal VB, Giri PA, Mahajan AS. Maternal and foetal outcome in pregnancy induced hypertension: A study from rural tertiary care teaching hospital in India. *Int Jour of Biomed Res;*2(12):595–9.
- Yadav S, Saxena U, Yadav R, Gupta S. Hypertensive disorders of pregnancy and maternal and fetal outcome: A case controlled study. *J Indian Med Assoc.* 1997;95(10):548–51.
- Tiwari A, Dwivedi R. A study to evaluate the perinatal outcome in pregnancy induced hypertension. *Int J Pediatr Res.* 2016;3(6):472–6.
- Nadkarni J, Bahl J, Parekh P. Perinatal outcome in pregnancy induced hypertension. *Indian Pediatrics.* 2001;38:174–8.
- Sibai BM. Eclampsia: VI. Maternal perinatal outcome in 254 consecutive cases. *Am J Obstet Gynecol.* 1990;163(3):1054–54. doi:0.1016/0002-9378(90)91123-t.
- Schiff E, Friedman SA, Mercer BM, Sibbai BM. Fetal lung maturity is not accelerated in pre eclamptic pregnancies. *Am J Obstet Gynecol.* 1993;169(5):1096–101. doi:10.1016/0002-9378(93)90262-h.
- Silveira RC, Procianny RS, Koch AS, Benjamin AC, Schindwein AF. Growth and neuro development outcome of very low birth weight infants delivered by preeclamptic mothers. *Acta Paediatr.* 2007;96(12):1738–42. doi:10.1111/j.1651-2227.2007.00552.x.
- Gupta BK. hypertensive disorder in pregnancy and its immediate outcome on neonates in tertiary care hospital. *Int J Basic Clin Pharmacol.* 2019;8(6):1343–8.
- Siromani SM. Neonatal Outcome In Pregnancy Induced Hypertensive Mothers - A Tertiary Care Centre Experience. *IOSR-JDMS.* 2015;14(11):23–7. doi:10.9790/0853-141192327.
- Nisar N, Memon A, Sohoo NA, Ahmed M. Hypertensive disorders of pregnancy: frequency, maternal and fetal outcomes. *Pakistan Armed Forces MedJ.* 2010;1(3):112–6.
- Goswami P, Lata H, Memon S, Khaskhelli LB. Excessive placental calcification observed in PIH patients and its relation to fetal outcome. *JLUMHS.* 2012;11(3):144–8.
- Kiondo P, Tumwesigye N, Wandabwa J, Wamuyu-Maina G, Bimenya G. Adverse neonatal outcomes in women with preeclampsia in Mulago Hospital. *Pan African Med J.* 2014;17(1):7. doi:10.11694/pamj.suppl.2014.17.1.3014.
- Gandhi MR. Perinatal outcome in pregnancy induced hypertension cases at GMERS Medical College, Dharpur-Patan, North Gujarat region, India: a prospective study. *Int J Adv Med.* 2015;2(2):152–5.

**Author biography****Sristi Ganguly**, Senior Resident**Supriya Mohanty**, Post Graduate**Madhusmita Pradhan**, Associate Professor**Jyoti Ranjan Champatiray**, Associate Professor

**Cite this article:** Mohanty S, Pradhan M, Champatiray JR, Ganguly S. Neonatal outcome in hypertensive disorders of pregnancy in tertiary care centre. *Panacea J Med Sci* 2022;12(1):23-28.