

**ORIGINAL RESEARCH****Clinical Study of Neonates Born to Mothers with Hypertensive Disorders of Pregnancy (HDP)****Gajula Ravi<sup>1</sup>, Janardhan Reddy Pulluru<sup>2</sup>, Suraboina Satishkumar<sup>3</sup>**<sup>1</sup>Assistant Professor, Department of Pediatrics, Govt Medical College, Siddipet, Telangana, India.<sup>2</sup>DNB, Resident, Yashoda Hospital, Secunderabad, Telangana, India.<sup>3</sup>CAS Specialist, Area Hospital, Miryalaguda, Nalgonda District, Telangana, India.**ABSTRACT**

**Background:** Globally, hypertensive disorders of pregnancy (HDP) are one of the major causes of perinatal and maternal morbidity and mortality. These disorders are characterized by increase in blood pressure (BP) which may be present before or appear for the first time during pregnancy after 20 weeks with or without proteinuria or evidence of multiorgan involvement and have been classified into preeclampsia (PE) and eclampsia syndrome, chronic hypertension (CH), PE superimposed on CH, and gestational hypertension. The HDP may complicate 5%–10% of all the pregnancies with the prevalence of 6.9%–7.9% in India. Studies have shown that HDP accounts for around 16% of 2.6 million stillbirths and 15% of perinatal deaths globally. Higher rates of adverse perinatal outcome such as preterm delivery, low birth weight, birth asphyxia, stillbirth, and early death have been reported worldwide in women having HDP. Prematurity and preterm birth are documented as the most common cause of perinatal death in Indian women with HDP. The present study was conducted with the aim to know the type of hypertension affecting the pregnant women and perinatal outcome. **Aims and objectives:** To determine the outcome of neonates born to mothers with Hypertensive Disorders of pregnancy in comparison with neonatal outcome in babies born to normotensive mothers.

**Materials and Methods:** A comparative case control study will be performed on Neonates fitting into inclusion criteria from JAN 2019 to Jun 2020 and a prestructural performa will be used to obtain detailed History taking, Clinical examination. The comparison will be done between two groups. The study group, which will include neonates born to mothers with either gestational hypertension, preeclampsia or eclampsia. The control group, which will include all babies born to normotensive mothers, matched for gestation with the study group during the study period.

**Results:** The results showed that the primary and the secondary outcomes in the study group was significantly poorer compared to control group. There was significantly high rate of death among the neonates born in the study group ( $p < 0.05$ ). Also there was higher rate of meconium stained amniotic fluid (16%), more requirement of surfactant (14%) and more requirement of NICU admission (31%) among the study group. There was also higher rate of IUGR (20%) as well as higher rates of Low birth weights among study group.

**Keywords:** Hypertensive Disorders of Pregnancy (HDP), Pre-Eclampsia, Gestational Age.

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## INTRODUCTION

Hypertensive disorders complicating pregnancy (HDP) is the most common complication in pregnancy. The incidence varies in different populations and is affected by the definition used. HDP is influenced by nulliparity, age, and race. In India in 2006, the incidence of HDP was 5.38%, while preeclampsia, eclampsia, and HELLP (hemolysis, elevated liver enzymes, and low platelet count) syndrome accounted for 44%, 40%, and 7% of complications, respectively.<sup>[1]</sup> Maternal and perinatal deaths have been reported in 5.5% and 37.5% of deliveries, respectively.<sup>[1]</sup> HDP comprises preeclampsia and eclampsia. The former is a multisystem disorder of unknown etiology that affects 4%–5% of pregnancies whereas the latter is the occurrence of seizures in women with preeclampsia.<sup>[2,3]</sup> The incidence of eclampsia is 0.3%–0.9% and it has a maternal mortality rate of 0.5%–10.0%.<sup>[4]</sup>

The pathogenesis of HDP is not completely clear. It is a multifactorial disease and its central pathogenesis seems to involve the systemic activation and injury of maternal endothelial cells, which manifests as raised blood pressure (BP), proteinuria, systemic inflammatory response, and accumulation of antiangiogenic factors, which seem to cause the disease by depriving the glomerular endothelial cells of essential growth factors. Pregnancy termination reverses the clinical manifestations of the disease, suggesting that trophoblastic invasion has a central role in the pathogenesis of preeclampsia.<sup>[5]</sup> A recent study revealed that excessive placental secretion of soluble fms-like tyrosine kinase-1 may contribute to endothelial dysfunction, hypertension, and proteinuria in preeclampsia.<sup>[5]</sup> In a multicenter study, approximately 30% of HDP cases were due to chronic hypertension, while 70% were due to gestational hypertension/preeclampsia.<sup>[6]</sup>

Very few studies have explored hypertensive disorders of pregnancy in India, even though these disorders have been associated with adverse maternal and perinatal outcomes.<sup>[7]</sup> The aim of the study reported here was to analyze the disease pattern and risk factors associated with the disorder and to assess the maternal and fetal outcomes in cases of HDP.

## MATERIALS & METHODS

**Source of data:** The Neonates born to mothers with Hypertensive disorders of pregnancy and normotensive mothers and delivered at Yashoda Hospital, Secunderabad

**Method of collection of data:** A comparative case control study will be performed on Neonates fitting into inclusion criteria from Jan 2019 to June 2020 and a prestructural performa will be used to obtain detailed History taking, Clinical examination.

### Inclusion Criteria:

The study will include two groups. The Study group: It will include neonates born to mothers with either gestational hypertension, preeclampsia or eclampsia with the following criteria:- Gestational hypertension – new onset non proteinuric hypertension (systolic pressure elevated more than 140 mm of Hg and diastolic pressure more than 90 mm of Hg) which resolves within 12 hours postpartum.

Preeclampsia – hypertension with proteinuria (systolic pressure elevated more than 140 mm of Hg and diastolic pressure more than 90 mm of Hg and proteinuria more than 300 mg in a 24 hour period) or preeclampsia with increasing certainty i.e.: BP more than equal to 160/100 mm Hg. Proteinuria 2g/24 hours, Serum creatinine > 1.2 mg/dl, Persistent headache /cerebral/visual disturbance, Persistent epigastric pain.

Eclampsia – seizures that cannot be attributed to other causes in a woman with preeclampsia  
The control group: It will include all babies born to normotensive mothers, matched for gestation with the study group during the study period.

Exclusion Criteria for Study Group and Control Group: Babies born to mothers when pregnancy is complicated by any other riskfactors other than HDP. Babies born to mothers with hypertension diagnosed before 20 weeks of gestation. If Parents refuse to give informed consent.

### Statistical analysis:

Data will be analyzed using mean, standard deviation, chi square test. Consent: Details of study will be explained to mother and informed consent will be taken before recruitment.

## RESULTS

A total number of 720 subjects are included in this study of which 600 neonates born to normal pregnant women are taken as Controls and 120 neonates born to mother with Hypertensive disorders of pregnancy are included. All subjects are of more than 20 weeks of gestation. Appropriate statistics applied to obtain the results.

The mean SBP among hypertensive group is 158.2 mmHg whereas mean SBP of normal group is 124.1mmHg. There is statistically significant difference among the two groups regarding SBP.

The mean DBP among hypertensive group is 101.2 mmHg whereas mean DBP of normal group is 74.2 mmHg. There is statistically significant difference among the two groups regarding DBP.

Table 1: Comparison of parity of mother in two groups

Parity of mothers	Hypertensive group		Normotensive group		Total
	Frequency	Percentage	Frequency	Percentage	
Multigravida	40	36.7%	240	40 %	280
Primigravida	80	66.7%	360	60%	440
Total	120	100.00%	600	100.00%	720

Chi square value = 1.41      df = 1 P value = 0.219

Majority of the cases were born to primigravida mothers. 80 of the 120 cases were born to primigravida mothers which constituted 66.4% of all the cases whereas 360 of the 600 controls were born to primigravida mothers which constituted 60.0 % of all the cases. From the table it can be concluded that PIH is seen more in primigravida mothers than in multipara women. On the other hand 40 of the total 120 cases were born to multigravida mothers whereas 240 of the total 600 controls which constitutes 39.4% were born to multigravida mothers.

**Comparison of age of the mother in two groups:** Majority of the mothers in the cases belonged to the age groups of 23-27 years which constituted 50 % of all the cases. The majority of the controls were also in the age group of 23-27 years, which constituted 80 % of all the cases. There is no much significant difference in between the groups. There were 24 cases whose mothers were in between the age groups of 28 - 32 years which constituted 20% of all the cases. On the other hand only 1 control had a mother who was in the age groups of 28-32yrs.

**Mean Age of mothers in Cases and Controls:** The mean age of mother with PIH was 27 years whereas the mean age group of normotensive mothers was 22. There is statistically significant correlation between the age of the mother and occurrence of PIH.

### Comparison of gestational age at delivery in two groups

The number of early preterm in the cases group was 15 which constituted 14 % of all the cases in the group. 21 babies in the control group were early preterm which constituted 4 %

of all the cases. There is statistical significance for association of PIH with delivery of early preterm neonates.

The number of cases born as late preterm was 27 which constituted 22 % of all the cases in the group. The number of controls born as late preterm was 22 which constituted 4 % of all the cases in the group. There is statistical significance for association of PIH with delivery of late preterm neonates.

The overwhelming majority of the cases born were term neonates (572 of the 600) which constituted 93 % of the control group whereas 80 out of 120 cases were born as term neonate which constituted 66 % of the control group.

The mean gestational age seen in PIH group was 38.56 weeks whereas it was 39 weeks in the normotensive group. There is statistical association between gestational age and presence of PIH. The number of cases born via LSCS was 20 out of the 120 which constituted 16 % of all the cases whereas 70 of the 600 controls were born via LSCS which constitutes 12 % of all the control. This was of statistical significance.

The number of cases born via vaginal was 85 out of the 120 which constituted 70 % of all the cases whereas 482 of the 600 controls were born via vaginal which constitutes 78% of all the control. This was of statistical significance. The number of cases born via assisted vaginal delivery was 22 out of the 120 which constituted 15.6 % of all the cases whereas 58 of the 600 controls were born via assisted vaginal delivery which constitutes 9% of all the control. This was of statistical significance.

### Primary outcome in two groups

Table 2: Comparison of primary outcome in two groups

Primary outcome	Hypertensive group		Normotensive group		Total
	Frequency	Percentage	Frequency	Percentage	
Intrauterine death	3	2.50%	4	1.20%	7
Live birth	117	97.50%	594	98.80%	713
Total	120	100.00%	600	100.00%	720

Fischer's exact test P value = 0.226

In the cases group 3 out of the 120 had Intra uterine death which constitutes 2.5% of all the cases in the group. On the other hand 4 out of 600 controls had Intra uterine death which constitutes 1.2% of all the controls in the group. This was not of statistical significance.

In the cases group 117 out of the 120 had live births which constitutes 97.5 % of all the cases in the group. On the other hand 594 out of 600 controls had live births which constitutes 98.8 % of all the controls in the group. Comparison of secondary outcome in two groups

Table 3: Comparison of secondary outcome in two groups

Secondary outcome	Hypertensive group		Normotensive group		Total
	Frequency	Percentage	Frequency	Percentage	
Died	10	8.4%	4	0.70%	14
Shifted to mother side (Live)	110	91.60%	596	99.30%	706
Total	120	100.00%	600	100.00%	720

Fischer exact test P value < 0.05 Odds ratio is 5.91 (CI of 2.54 to 13.73).

After following up the cases for outcome, 10 of the 120 cases died eventually, which constituted 8.4% of all the cases whereas only 4 of 600 controls died, which constituted 0.7% of all the controls. This was of statistical significance.

110 of the 120 cases were alive and healthy on follow up ,which constituted 91.6% of all the cases where as 596 out of 600 controls were alive and healthy on follow up, which constituted 99.3% of all the controls.

Comparison of amniotic fluid status in two groups

Table 4: Comparison of amniotic fluid status in two groups

Amniotic Fluid status	Hypertensive group		Normotensive group		Total
	Frequency	Percentage	Frequency	Percentage	
Meconium stained amniotic fluid	20	16.40%	15	2.50%	35
Normal	100	83.60%	585	97.50%	685
Total	120	100.00%	600	100.00%	720

Chi-square value = 43.08      df = 1 P value < 0.05

It was found that 20 cases out of the total 120 cases had meconium stained amniotic fluid which constituted 16.4% of all the cases in the group. On the other hand, only 15 out of the total 600 controls had meconium stained amniotic fluid (2.5%).This was of statistical significance.100 out of the 120 cases had normal amniotic fluid (83.6%) whereas 585 out of the 600 controls had normal amniotic fluid (97.5%).

Table 5: Comparison of treatment with surfactant in two groups

Surfactant Treatment	Hypertensive group		Normotensive group		Total
	Frequency	Percentage	Frequency	Percentage	
No	103	85.70%	585	97.50%	688
Yes	17	14.30%	15	2.50%	32
Total	120	100.00%	600	100.00%	720

Chi-square value – 31.86      df = 1 P value < 0.05

Of 120 live cases, 17 cases required surfactant administration via INSURE technique which constituted 14.3% of all the cases ,where as only 15 out of the 600 controls required surfactant administration, which constitutes 2.5% of all the cases. This was of statistical significance

Comparison of birth weight in two groups

Table 6: Comparison of birth weight in two groups

Weight of the newborn	Hypertensive group		Normotensive group		Total
	Frequency	Percentage	Frequency	Percentage	
ELBW	6	4.90%	5	1.00%	11
LBW	24	22.10%	15	2.50%	39
Normal	80	65.60%	571	95.10%	651
VLBW	10	7.40%	9	1.50%	19
Total	120	100.00%	600	100.00%	720

Chi-square value = 99.208      df=1      P value < 0.05

Among the cases , 6 out of the total 120 cases were born as Extreme low birth weight neonates, which constitutes 4.9% of all the cases . On the other hand, only 5 out of the total 600 neonates were born as Extreme low birth neonates which constitutes only 1% of all the neonates in the control group. This is of statistical significance.

Among the cases , 10 out of the total 120 cases were born as Very low birth weight neonates, which constitutes 7.4% of all the cases . On the other hand, only 9 out of the total 600 neonates were born as Very Low birth neonates which constitutes only 1.5% of all the neonates. This was of statistical significance. Among the cases , 24 out of the total 120 cases were born as low birth weight neonates , which constitutes 22.1% of all the cases . On the other hand, only 15 out of the total 600 neonates were born as low birth neonates which constitutes only 2.5%of all the neonates. This was of statistical significance. Among the cases, 80 out of the total 120 cases were born as normal weighing neonates , which constitutes 65.6% of all the cases . On the other hand, only 571 out of the total 600 neonates were born as normal weighing neonates which constitutes a 95.1%% of all the neonates. This was of statistical significance.

Out of the total 120 cases, 97 cases were born appropriate to gestational age (AGA) which constitute about 81 % of all the cases whereas 572 of the 600 controls were born appropriate to gestational age.

On the other hand Small for gestational age(SGA) was much more common among the cases constituting about 20.5% of all the cases (25 out of 120) whereas small for gestational age constituted 3.5% of the births in control group. This association is of statistical significance. There were no Large for gestational age (LGA) neonates seen in the case group, but large for gestational age constituted about 1.9% of all the births in control group. Apgar score Apgar score of 7 at one minute, which is consider normal for a neonate was seen in 577 of the total 600 live births , which constitutes 96.2% of all the live births whereas Apgar score of 7 was seen only in 91 out of 120 (76.5%)live births which is of statistical significance Apgar score of 6 and 5 was seen among 12 and 15 cases respectively which constitutes about 22.7% of all the cases .On the other hand, Apgar score of 6 and 5 was seen in 3 and 17 controls respectively which constitutes 3.3% of all the controls.

Apgar score of 9 at 5 th minute, which is considered normal in neonates was seen in 106 of the 120 live births which constituted 89.1% of all the cases. On the other hand, 577 of the 600 neonates born in control groups had Apgar score of 9. This is of statistical significance.

## DISCUSSION

Preeclampsia is the development of hypertension with proteinuria, oedema or both, after 20th week of gestation. If pre-eclampsia progresses without proper treatment patient may eventually develop eclamptic convulsions.<sup>4</sup> Pre-eclampsia develops in about 2% of pregnancies and is still responsible for a significant proportion of perinatal and maternal morbidity and mortality.<sup>[7]</sup>

Factors that appear to have a role include the abnormal placentation, maternal immune response, genetic predisposition, and maternal vascular disease.<sup>[7]</sup>

A number of studies have been done to see for neonatal outcome in mothers in pregnancy induced hypertension. A total number of 720 subjects are included in this study of which 600 neonates born to normal pregnant women are taken as Controls and 120 neonates born to mother with Hypertensive disorders of pregnancy are included. All subjects are of more than 20 weeks of gestation. Appropriate statistics applied to obtain the results.

### Parity:

Also most women who had pre-eclampsia in this study, were Primigravida (i.e66.4%), this is not unusual as this type of hypertensive disorder is commoner in women pregnant for the first time. It has been traditionally seen that pre-eclampsia is associated with primigravida mothers.<sup>[7]</sup>

The results are similar to the results of doddamani et al done in Bagalkot<sup>7</sup> which observed that 66.6% of mothers with PIH were Primigravida.

Age of the mothers: Advanced maternal age is a risk factor for pregnancy induced hypertension. It is also important to note that Maternal age at the time of first delivery is getting advanced in our country for a variety of reasons. It was observed in our study that the majority of the mothers belonged to the age groups of 23-27 years which constituted 50 % of all the cases. The majority of the controls were also in the age group of 23-27 years, which constituted 80 % of all the cases. There is no much significant difference in between the groups.

There were 24 cases whose mothers were in between the age groups of 28 - 32 years which constituted 20 % of all the cases. On the other hand only 1 control had a mother who was in the age groups of 28-32 yrs.

**Mean Age of mothers in Cases and Controls:** The mean age of mother with PIH was 27 years whereas the mean age group of normotensive mothers was 22 . There is statistically significant correlation between the age of the mother and occurrence of PIH. This is comparable to various studies that have been done like Avni et al.<sup>[8]</sup>

**Gestational age:** There is high probability of mothers with hypertension to have preterm deliveries as the presence of hypertension in the mothers is a form of stress. This hypertension can lead to spontaneous rupture of membranes. Also a vast majority of the cases have either delivery induced or pregnancy terminated via LSCS as the only definitive treatment for PIH is termination of pregnancy.

It was seen in our study that there was high percentage of early preterm and late preterm which was of statistical significance. The early preterms 14% were as high as whereas late preterms were as high as 22%.

In the study done in Bagalkot 7 the preterm delivery constituted 46% of all delivery in the hypertensive mothers whereas it was seen in 23% of all delivery in a study conducted by Nadkarni et al in Indore.<sup>[9]</sup> Mean gestational age: The mean gestational will generally be lower in the PIH group as there high chances of spontaneous labour as well as higher higher chances of termination of pregnancy. Another problem is preterm delivery with maternal hypertensive disorder of pregnancy. Epidemiologic studies have reported alarmingly high rates of preterm births, predominantly due to preeclampsia. In our study mean gestational age seen was 38.56 weeks in the hypertensive group whereas it was 39 weeks in the normotensive group.

In a study done by Sandhya Sivakumar et al,<sup>[10]</sup> in Pondicherry it was found that the mean gestational age in hypertensive group was 37.4 weeks compared to 38.6 weeks in normotensive group.

**Mode of delivery:** The mode of delivery in a case of pregnancy induced hypertension assumes importance as the only definitive treatment for PIH is termination of pregnancy. These mothers cannot be kept for spontaneous and normal labor due to high chances of maternal and fetal morbidity as well as mortality.

Also the mode delivery is of concern for pediatricians as the chances of maternal trauma is higher in certain forms of assisted vaginal delivery as well LSCS deliveries. It was seen in our study that majority of the deliveries were conducted vaginally in both the groups, but there was a statistically high percentage of mothers in the hypertensive group getting delivered via assisted vaginal delivery (15.6 %) as well as lower segment cesarean section (16.4%). The percentage of deliveries occurring through assisted vaginal delivery and lower segment cesarean section was substantially lower in the normotensive group. In our study operative delivery were reported to be increased in hypertensive disorders of pregnancies as seen in another study by Avni et al.<sup>[8]</sup>

In a study done by Sibai et al in Brazil it was found that the operative delivery in mothers with PIH was as high as 65.6% 4 whereas it was found to be 46 % in a study done at Bagalkot 7.

**Primary outcome:** It was seen in our study that the primary outcome in the normotensive group was much better than the primary outcome in the hypertensive group. There were 2.5% of intrauterine deaths and still borns in the hypertensive group compared to 1.2% of intrauterine deaths seen in the normotensive group although this was not of any statistical significance. The IUD rate in the hypertensive group can be attributed to defective uteroplacental circulation leading to growth restriction to the fetus in utero. In a study done by Jain Avni et al from Nagpur, it was found that the percentage of IUD was as high as 24.2%.<sup>[7]</sup> The lower rate of IUD can be attributed to good antenatal care and monitoring provided in our hospital.

**Secondary outcome:** When the live neonates were followed up to see for the eventual outcomes, it was seen that a quite a significant number of neonates born to mothers with hypertensive disorder of pregnancy eventually died (8.4%). Only 91.6% of the neonates were deemed fit enough to be shifted to mothers side. In the normotensive group an overwhelming majority of the neonates were deemed fit to be shifted to mothers side (99%). The majority of the neonates in the hypertensive group died due to complications associated with PIH. Most common cause that was attributed was Preterm delivery. The other causes leading to death was Meconium aspiration syndrome, hypoxic ischemic encephalopathy and Sepsis. In a study done by Nadakarni et al,<sup>[9]</sup> from Indore it was found that Birth asphyxia [56 (14%)] was the commonest complication. Other neonatal complications requiring admission were prematurity in 42 (10.5%), septicemia in 30 (7.5%), respiratory distress syndrome in 29 (7.3%).

**Amniotic fluid status:** Meconium is the first stool of an infant, composed of materials ingested during the time the infant spends in the uterus. Meconium is normally stored in the infant's intestines until after birth, but sometimes (often in response to fetal distress and hypoxia) it is expelled into the amniotic fluid prior to birth, or during labor. If the baby then inhales the contaminated fluid, respiratory problems may occur. In our study it was seen that 16.4% of mothers born in the hypertensive group had meconium stained amniotic fluid as compared to 2.5% of mothers in the normotensive group. The study finding is similar to the other studies that have been done.<sup>[8-10]</sup>

**Birth weight:** It was seen that a many children born to mothers in the hypertensive group had lower birth weights than expected. It was seen that the 4.9% of neonates born to hypertensive mothers were born as extremely low birth weight babies whereas 22% of neonates were born as low birth weight. Only 65% of the neonates had adequate weight. This is the result of two factors that occur in the neonates with mothers who have hypertension. The first factor responsible for the low birth weight is the presence of high degree of preterm deliveries that are seen in the mothers with hypertensive disorders of pregnancy. The second factor that causes low birth weight is the presence of high degree of Intrauterine growth restriction seen in the neonates born to mothers with hypertensive disorders of pregnancy. This is usually due to utero placental insufficiency and also due to micro circulatory failure that is seen in mother with PIH. In another study, the percentage of term neonates (37–40 weeks) were 26.66%. The percentage of preterm and low birth weight babies were high in this study as seen in various earlier studies too.<sup>[10,11]</sup>

In a study done by Avni et al, the mean birth weight was found to be 2.9 Kgs. In a study done in Bagalkot it was found that the percentage of Low birth weight was 48% where percentage of Very low birth weight was 12%.

**Presence of Intrauterine growth restriction:** Intrauterine growth retardation (IUGR), which is defined as less than 10 percent of predicted fetal weight for gestational age, and it may result in fetal morbidity and mortality if it is not adequately diagnosed and treated. The condition is commonly caused by the inadequate maternal-fetal circulation, with a resultant decrease in fetal growth.

Maternal causes of IUGR account for most uteroplacental cases. Chronic hypertension is the most common cause of IUGR. The infants born to mothers with PIH, have a three-fold increase in perinatal mortality compared to neonates with IUGR who are born to normotensive mothers. In our study it was seen that IUGR was seen in 20.5 % of neonates born to mothers with PIH. In comparison only 3.5% of neonates born to mother with normotension had IUGR.

In a study done by Yadav et al, it was found that the chances of IUGR in Hypertensive group was 22.3% of all cases. Pregnancies complicated by intrauterine growth restriction (IUGR), defined as a pathological process of reduced fetal growth, have been associated with an increase in perinatal mortality.<sup>[11]</sup>

**Apgar Score:** Apgar score is a method to quickly summarize the health of newborn children. Apgar is a quick test performed on a baby at 1 and 5 minutes after birth. The 1-minute score determines how well the baby tolerated the birthing process. The 5-minute score tells the health care provider how well the baby is doing outside the mother's womb. Low APGAR score was seen in various studies which agrees with our study. In our study it was seen that Apgar score of 7 at one minute, which is considered normal for a neonate was seen in 577 of the total 600 live births, which constitutes 96.2% of all the live births whereas Apgar score of 7 was seen only in 91 out of 119 (76.5%) live births which is of statistical significance.

## CONCLUSION

Hypertensive disorders of pregnancy are the complex multisystem disorders characterized by widespread endothelium dysfunction involving all the vital organ systems. These disorders are associated with marked mortality and morbidity in both mother and fetus.

The present study concludes that the neonatal outcome in mothers with pregnancy induced hypertension is a lot poorer compared to the normal population. Hence, it is important to recognize the symptoms of PIH early in the mother so that the complications such as Low birth weight, Intra uterine growth restriction, Intra uterine deaths can be prevented. It is also essential to have a comprehensive plan for evaluation and treatment of neonates born to mothers with PIH, so that the neonate can be adequately managed without future morbidities as well as mortality.

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## REFERENCES

1. Prakash J, Pandey LK, Singh AK, Kar B. Hypertension in pregnancy: hospital based study. *J Assoc Physicians India*. 2006;54:273–278. [PubMed] [Google Scholar]
2. Sibai BM, Mercer B, Sarinoglu C. Severe preeclampsia in the second trimester: recurrence risk and long-term prognosis. *Am J Obstet Gynecol*. 1991;165(5 Pt 1):1408–1412. [PubMed] [Google Scholar]
3. Barton JR, O'Brien JM, Bergauer NK, Jacques DL, Sibai BM. Mild gestational hypertension remote from term: progression and outcome. *Am J Obstet Gynecol*. 2001;184(5):979–983. [PubMed] [Google Scholar]
4. Sibai BM, Sarinoglu C, Mercer BM. Eclampsia. VII. Pregnancy outcome after eclampsia and long-term prognosis. *Am J Obstet Gynecol*. 1992;166(6 Pt 1):1757–1761. discussion 1761–1763. [PubMed] [Google Scholar]
5. Maynard SE, Min JY, Merchan J, et al. Excess placental soluble fms-like tyrosine kinase 1 (sFlt1) may contribute to endothelial dysfunction, hypertension, and proteinuria in preeclampsia. *J Clin Invest*. 2003;111(5):649–658. [PMC free article] [PubMed]

6. Matthys LA, Coppage KH, Lambers DS, Barton JR, Sibai BM. Delayed postpartum preeclampsia: an experience of 151 cases. *Am J Obstet Gynecol.* 2004;190(5):1464–1466. [PubMed] [Google Scholar]
7. Doddamani G, Doddamani U. Perinatal Outcome in Pre-Eclampsia: A Prospective Study. *Sch. J. App. Med. Sci* 2014; 2(1C):291-293.
8. Avni J, Manju L, Sharma A, Bajpai N. A Prospective Study to Compare Maternal and Perinatal Outcome in Hypertensive Disorders in Pregnancy in Himalayan Region of India. *Int J Biol Med Res.* 2014; 5(2): 4071-4074.
9. Nadkarni J, Bahl , Parekh P. Neonatal outcome in Pregnancy associated Hypertension. *Indian Pediatrics.* Indian Pediatrics 2001; 38: 174-178.
10. Sivakumar S, Bhat B, Badhe B. Effect of Pregnancy Induced Hypertension on Mothers and their Babies. *Indian J Pediatr* 2007; 74 (7) : 623-625
11. 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: 548-6551.