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## Original Research Article

# Comparative study of early neonatal outcome in low birth weight babies in hypertensive disorders complicating pregnancies with the mode of delivery

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## ABSTRACT

**Background:** Pregnancy induced Hypertension (PIH) is strongly associated with intrauterine fetal growth restriction (IUGR), low birth weight (LBW) and admission to NICU. PIH is not by itself an indication for caesarean delivery. However, the incidence of caesarean is high because of the development of complications in mother and the need to deliver prematurely.

**Aims:** To compare the immediate morbidity and survival advantage of LBW vertex presenting babies with the mode of delivery in hypertensive disorders complicating pregnancies.

**Materials and Methods:** This was a comparative cross-sectional study done on women admitted to the labour ward during the study period with PIH delivering a baby through either a vaginal delivery or a caesarean section with a birthweight of <2.5kgs. A detailed history taking and clinical examination was done. Babies were followed up for one week following delivery to note down the early neonatal outcome.

**Results:** In this study, over all there was no statistically significant difference in neonatal outcome in both vaginal delivery and caesarean section groups. However, there was slight increased incidence of prematurity (68% vs 64%), Birth Asphyxia (14% vs 8%), Sepsis (8% vs 6%), IVH (6% vs 2%) and Hyperbilirubinemia (16% vs 14%) in vaginal delivery group. While, RDS (20% vs 14%) and NEC (4% vs 2%) had higher incidence in caesarean delivery group. Overall, prematurity and IUGR resulting in LBW, contributed to these neonatal complications.

**Conclusion:** Caesarean delivery offers no short-term survival advantage compared with vaginal delivery for LBW vertex presenting foetuses in PIH patients. Neonatal outcomes are not worsened by spontaneous or induced vaginal delivery in women with hypertension with good control and also decreases morbidity due to caesarean section to the mother.

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## 1. Introduction

Pregnancy induced hypertension (PIH) is responsible for 8-10% of all preterm births, 18% of fetal and infant mortality, and 46% of infants born are small for gestation (SGA).<sup>1</sup> PIH is not by itself an indication for caesarean delivery. Although the evidence favouring caesarean delivery remains uncertain, in most cases of severe preeclampsia before 34 weeks, approximately 80% of these women will end up

having caesarean delivery.<sup>2</sup>

The rate of primary caesarean section is increased by 50% in the last decade with preeclampsia contributing 10%.<sup>3</sup> Although caesarean section is common, there is no current evidence supporting the use of caesarean section, in favourable obstetric situations and in the absence of severe foetal hemodynamic disturbances.<sup>4</sup> Induction of labour in women with severe preeclampsia is not harmful to low birth-weight infants and appears to be a safe mode of delivery.<sup>4</sup>

Pregnancies complicated by hypertension are associated with an increased risk of antagonistic foetal, neonatal as

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well as maternal consequences, comprising of intrauterine growth restriction, preterm birth, post or antepartum haemorrhage, acute renal and hepatic failure and lastly maternal and perinatal death.<sup>5</sup>

Hypertensive circumstances of pregnancy can be categorised as follows – a division is made at about 20 weeks of gestation. The women who are hypertensive prior to 20 weeks are said to have chronic or pre-existing hypertension in the absence any other pathology unrelated to pregnancy. Primigravida are at an increased risk for PIH. It can follow in the subsequent pregnancies also. Age is a cardinal factor in PIH (Women more than Age of 40 years as well as teenagers). Most commonly observed PIH progresses during the second half of pregnancy typically after the 20th week.

Basic classification of hypertensive disease in pregnancy include.<sup>6</sup>

1. Gestational HTN – BP >140/90mmHg after 20 weeks in previously normotensive women.
2. Preeclampsia syndrome – Gestational HTN with proteinuria.
3. Eclampsia syndrome – Women with preeclampsia, convulsion/ coma that cannot be attributed to another cause. Seizures are generalized and may appear before, during or after labour.
4. Preeclampsia superimposed on Chronic HTN – Chronic underlying HTN is diagnosed in women with documented BP> 140/90 mmHg before pregnancy or before 20 weeks gestation or both.

Maternal complications – include HELLP syndrome, temporary blindness, abruptio placentae, disseminated intravascular coagulation (DIC), acute renal failure (ARF), pulmonary oedema, arrhythmias, intracranial or hepatic haemorrhage, adult respiratory distress syndrome (ARDS), hypervolemia and risk of recurrent preeclampsia.

Foetal complications - Intrauterine growth retardation, preterm birth, small for gestational age and foetal death, HELLP syndrome, Abruptio placentae, DIC, ARF, Cardiogenic pulmonary oedema, Haemorrhage.

## 2. Aims and Objectives

The objective of this study is to compare the immediate morbidity and survival advantage of low birth weight vertex presenting babies delivered vaginally and by caesarean section in hypertensive disorders complicating pregnancies.

## 3. Materials and Methods

### 3.1. Source of data and sample size

The study was undertaken at Mamata General Hospital, Khammam from August 2017 to July 2019. The study population consisted of 100 women delivering LBW babies

with Hypertension complicating pregnancies who were divided into two groups-50 women in vaginal delivery group and 50 women in caesarean delivery group.

### 3.2. Study design

Comparative cross-sectional study.

### 3.3. Method of data collection

This was a comparative study between two groups for early neonatal outcome of LBW infants delivered vaginally and by caesarean section in hypertensive disorders complicating pregnancies. Women admitted to the labour ward during the study period with PIH delivering a baby through either a vaginal delivery or a caesarean section with a birthweight of <2.5kgs were included in this study. A detailed history taking and clinical examination was done. Babies were followed up for one week following delivery to note down the early neonatal outcome.

### 3.4. Inclusion criteria

1. Babies born with a birth weight of less than 2.5kgs to mothers with PIH.
2. All women with a singleton, vertex presenting fetus of more than 28 weeks gestation with PIH were included in the study.

### 3.5. Exclusion criteria

1. All pregnant women with PIH getting terminated before 28 weeks were excluded
2. Birthweight more than or equal to 2.5 kgs
3. Multifetal gestation
4. Malpresentation
5. Congenital fetal anomalies.
6. Maternal diseases such as Gestational Diabetes, Cardiac diseases, etc. and other medical disorders.
7. Other obstetric complications requiring Caesarean section like Placenta previa, Contracted pelvis, Cephalopelvic disproportion.
8. Women not giving consent for the study.

### 3.6. Statistical analysis

The data which was collected from the study was analysed using tests like chi-square, which was used for categorical data where, the P value <0.05 was considered to be statistically significant.

## 4. Observation and Results

56% in vaginal delivery group and 46% in caesarean delivery group belonged to the age group of 21-25 years. Most common gestational age of termination in vaginal delivery group was 28-32 weeks with 42% whereas, in

caesarean delivery group the most common gestational age was 37-40 weeks with 36%. No statistically significant difference was found between two groups in the terms of antenatal care and parity. (Table 1)

Anaemia was the most common associated complication -48% in vaginal 66% in caesarean delivery group. Previous LSCS was more commonly associated with caesarean delivery group (30%).

HELLP was the most common complication seen - 6% in vaginal, 14% in caesarean section followed by abruptio placentae-6% and 12% in vaginal and caesarean delivery group respectively. One maternal death had occurred in caesarean group, which accounted for 2% of maternal mortality. Women with complications underwent caesarean section as they required immediate termination.

#### 4.1. Neonatal outcome

28% of babies in vaginal delivery group and 60% of babies in caesarean delivery group had IUGR with abnormal Doppler. This result was statistically significant with P value=0.0012 and out of all abnormal doppler cases with PIH and LBW 68% underwent caesarean section. Term babies with IUGR were more in caesarean delivery group. Extremely low birth weight babies were slightly more in vaginal delivery group (8% vs 2%) as babies were not salvageable and so, were allowed for vaginal delivery. In both the vaginal and caesarean delivery group, there was no significant difference in APGAR score at 1 min, but there was improved APGAR score at 5 mins in caesarean delivery group which was statistically significant (P=0.00225). Higher rate of NICU admissions in vaginal delivery group was because of a greater number of complications, but this difference was not statistically significant. (Table 2)

In the present study, overall, there was no statistically significant difference in neonatal outcome in both the study groups. However, there was slight increased incidence of prematurity (68% vs 64%), Birth Asphyxia (14% vs 8%), Sepsis (8% vs 6%), IVH (6% vs 2%) and Hyperbilirubinemia (16% vs 14%) in vaginal delivery group. While, RDS (20% vs 14%) and NEC (4% vs 2%) had higher incidence in caesarean delivery group (Table 3). Overall, prematurity and IUGR resulting in LBW, contributed to these neonatal complications. The neonatal mortality rate was 16% in the vaginal delivery group and 8% in the caesarean delivery group (p-value is 0. 218355) which was not statistically significant, with most common cause being birth asphyxia followed by IVH.

In the present study, preeclampsia was most common variant of Hypertensive disorder in pregnancy with greater number of caesarean deliveries (64% vs 52%) (Table 4). This was because most of them had severe HTN with complications and needed immediate termination. In gestational hypertension, a greater number of vaginal deliveries were present (30% vs 14%) because most of

them proceeded to term gestation without complications associated with HTN.

## 5. Discussion

Over all in the present study, maximum number of patients were present between 21-25yrs age group. This was because, it is the age group with high fertility rate. As all women included in the present study had PIH and it is known fact that young women have increased risk of PIH due to early exposure to placental tissue. Most of the patients were booked elsewhere and referred to our hospital in both the study groups, as our hospital is a tertiary care centre with good NICU facilities, they were referred directly at the time of delivery, due to the complications. In present study, most of the women belonged to low socio-economic status in both the study groups with more number in caesarean section group (62%) compared to vaginal delivery group (56%). In pregnant women, low socioeconomic status can increase the risk of adverse pregnancy outcomes such as, preeclampsia, eclampsia, preterm delivery, low birth weight and increased caesarean section rates due to complications. Similar to present study, in a study done in Korea, they found that the possibility of Caesarean delivery was higher (45.8% vs. 39.6%, P<0.001) and the risks of preeclampsia (1.5% vs. 0.6%, P<0.001), eclampsia (0.1% vs. 0.0%, P=0.005), preterm delivery (2.1% vs. 1.3%, P<0.001), were higher in mothers in the low income group compared to those in middle/higher income group.<sup>7</sup>

In the present study, on the whole most of the patients were primigravida in both the study groups. Nulliparity is associated with increased risk of pre-eclampsia and eclampsia by two folds. Sibai and Cunningham reviewed a number of worldwide studies and concluded that the incidence of pre-eclampsia in nulliparous populations was more than that for multiparous.<sup>8</sup>

Pregnancy induced hypertension is the leading cause of medically indicated preterm birth and accounts for 25-43% of all such births, giving rise to a greater number of LBW babies.<sup>9</sup> In the present study, most of the deliveries were preterm and were delivered between 28-32 weeks of gestational age. Vaginal deliveries at 28-32 weeks (42%) were more compared to caesarean section (30%). Among these, most of them had severe forms of hypertension in pregnancy like preeclampsia and eclampsia. The term deliveries (37-40 weeks) were 36% in caesarean delivery group and 32% in vaginal delivery group. Although statistically not significant, rate of caesarean section was slightly more than vaginal delivery, because some patients in caesarean delivery group were associated with previous caesarean section and some had IUGR with abnormal doppler.

Anaemia along with PIH Contributes to LBW babies. Maternal anaemia is significantly associated with low birth weight and is considered as a public health problem in

**Table 1:** Comparison of maternal variables between vaginal and caesarean deliveries in LBW babies in hypertensive disorders complicating pregnancies

Maternal variables	Vaginal delivery(n=50)		Caesarean section(n=50)	
	21-25 years		21-25 years	
Most common age group	28	56%	23	46%
Antenatal care	Booked elsewhere and referred		Booked elsewhere and referred	
	28	56%	23	46%
Socio-economic status	Lower		Lower	
	28	56%	31	62%
Gravidity	Primigravida		Primigravida	
	30	60%	26	52%
Most common GA in weeks	28-32 weeks		37-40 weeks	
	21	42%	18	36%

**Table 2:** Early neonatal outcome

Most common	Vaginal delivery		Caesarean section	
	2.1-2.49		2.1-2.49	
Birthweight in kgs	20	40%	24	48%
APGAR at 1 min	4-6		4-6	
	39	78%	37	74%
APGAR at 5 min	7-10		7-10	
	28	56%	42	84%
NICU admission present	36	72%	32	64%

**Table 3:** Showing neonatal complications

Complications	Vaginal delivery		Caesarean section		P value
	No. of cases	Percentage	No. of cases	Percentage	
Prematurity	34	68%	32	64%	0.300381
Respiratory Distress Syndrome (RDS)	7	14%	10	20%	
Birth Asphyxia	7	14%	4	8%	
Meconium Aspiration Syndrome (MAS)	4	8%	2	4%	
Sepsis	4	8%	3	6%	
Hyperbilirubinemia	8	16%	7	14%	
Intraventricular Haemorrhage (IVH)	3	6%	1	2%	
Necrotising Enterocolitis (NEC)	1	2%	2	4%	
No complications	16	32%	21	42%	

The chi-square statistic is 1.0725. The p-value is 0.300381. The result is not significant at  $p < 0.05$ .

**Table 4:** Comparison of different types of hypertensive disorders in pregnancies with LBW babies with mode of delivery

Types of Hypertensive disorders	Vaginal delivery		Caesarean section	
	No. of cases	Percentage	No. of cases	Percentage
Gestational Hypertension	15	30%	7	14%
Preeclampsia	26	52%	32	64%
Eclampsia	5	10%	8	16%
Chronic hypertension with superimposed preeclampsia	4	08%	3	06%
Total(n=100)	50	100%	50	100%

the world, especially in developing countries. The meta-analysis done by Rahmati et al, showed a significant relationship between maternal anaemia and LBW with relative risk 1.26 (95% CI: 1.03-1.55).<sup>10</sup> In the present study, even though babies had LBW rates, previous LSCS was more commonly associated with caesarean section 30%, whereas only 12% of women had previous LSCS in vaginal delivery group. This was because unlike in Western literature,<sup>11</sup> our women belonged to younger age group in maximum number (21-25 years), which reflects early age of marriage and conception and majority of women belonged to low socioeconomic status. Referred subjects coming from rural area usually come in late labour without prior antenatal check-ups. Maximum number of subjects had no documentation of their previous Caesarean Section, which made decision for Trial of Labour difficult and usually culminating in Caesarean Section after a short trial.

Overall, in the present study, maternal complications were encountered in 22% of the women in vaginal delivery group and 50% of women in caesarean delivery group, similar to the study done by Dağdeviren et al.<sup>12</sup> and Seyom et al.<sup>13</sup> The reason for greater number of maternal complications in Caesarean deliveries in the present study was because, our hospital is tertiary care centre in this area, most of them were referred to our hospital due to complications and were admitted in a compromised state. With better facilities available, we tried to improve the pregnancy outcome by resorting to caesarean section. As it is a known fact that, prompt termination leads to reversal of pathology associated with preeclampsia. Women underwent caesarean section for immediate termination of pregnancy due to HELLP syndrome (14%), placental abruption (12%), renal failure (6%), foetal distress (60%).

Hypertension complicating pregnancy is associated with IUGR and LBW due to chronic uteroplacental insufficiency. In the present study, majority of the women in vaginal delivery group (72%) had normal doppler study. Present study also depicts that 60% of them in caesarean delivery group had abnormal doppler, whereas only 40% of them had normal doppler indices and this was statistically significant with P value=0.0012. Metanalysis done by Bujold E et al suggest that Caesarean sections are more appropriate for infants with IUGR due to risk factors like intrapartum asphyxia at birth, Meconium aspiration and foetal hypoxia due to their small size.<sup>14</sup>

In the present study, maximum number of babies had birth weight between 2.1-2.49 kgs, 40% in vaginal delivery group and 48% in caesarean group. However, a greater percentage of babies in caesarean delivery had birth weight between 2.1-2.49kgs when compared to vaginal delivery because, term deliveries were more in caesarean group (36%) compared to vaginal delivery group (32%). Even though they were term deliveries, as most of them had IUGR due to maternal hypertension, the babies had low

birth weight. This was similar to the study by Bauer J et al.<sup>15</sup>

In the present study babies delivered by caesarean section had improved APGAR at 5 min compared to those delivered by vaginal route similar to the study done by Chibber RM.<sup>4</sup> There are numerous factors that can influence the Apgar score, including maternal sedation or anaesthesia, congenital malformations, gestational age, trauma, and interobserver variability.<sup>16</sup> It is inappropriate to use an Apgar score alone to diagnose asphyxia.

In the present study, admission to neonatal intensive care unit was more in both the study groups with relatively higher rate in vaginal delivery group (72%) compared to caesarean delivery group (64%). This was because comparatively, less complications were seen in caesarean delivery group (58%) than vaginal delivery group (68%). As most of the babies were preterm, had IUGR and fetal distress being the most common indication for caesarean section in the present study, these were the reasons for increased rate of NICU admissions in both the study groups.

### 5.1. Prematurity

In present study maximum babies were preterm premature babies in both the groups-68% in vaginal and 64% in caesarean delivery group. Prematurity contributes to 12-14% of low birth weight babies in India in 2018.<sup>17</sup> These findings were consistent with studies by Alanis et al (68.8% in vaginal and 56% in caesarean delivery group).<sup>18</sup>

In present study lower incidence of RDS was seen in babies who went through labour (14%) compared to those delivered by caesarean section (20%). Similar results were seen in study by Alanis et al,<sup>18</sup> Regenstein et al<sup>19</sup> and Coppage et al.<sup>20</sup> Respiratory morbidity (respiratory distress secondary to transient tachypnea of the newborn, surfactant deficiency, and pulmonary hypertension) is increased as a result of failure to clear fetal lung fluid particularly in infants delivered by caesarean section without being exposed to labour.

In the present study, Birth Asphyxia was more commonly associated with vaginal delivery (14%) compared to 8% in caesarean delivery group. This was because severe preeclampsia and eclampsia, preterm delivery (28-32 weeks) and very low birthweight (1.01-1.5kg) which are strong risk factors for birth asphyxia were more commonly associated with vaginal delivery group compared to caesarean delivery group. During labour when contractions are too fast and strong, the placenta, which helps carry oxygen-rich blood to the baby, often cannot recharge with an adequate supply of this blood for the baby. As labour progresses, the baby's oxygen deprivation gets progressively worse and preterm infant cannot take the stress and may land up in birth asphyxia. In contrast to present study, results in the study by Alanis et al showed higher incidence of Birth asphyxia in caesarean delivery

group (37.3%) compared to vaginal delivery group (12%).<sup>18</sup>

In the present study meconium aspiration syndrome was more commonly associated with vaginal delivery (8%) compared to Caesarean section (4%). Birth asphyxia related to small for gestational age, IUGR babies and induction of labour with prostaglandin E 1 were all risk factors for meconium passage due to stress during labour process. Intrapartum caesarean section due to abnormal fetal heart rate patterns in labour was associated with MAS in present study.

In the present study sepsis was associated with both the groups-8% in vaginal and 6% in caesarean delivery group. Neonates who had sepsis had one or more risk factors like preterm with IUGR, birth weight less than 1.5 kg, PPROM/PROM, history of meconium stained liquor and age less than 7 days. 6% of babies delivered by LSCS had sepsis because they were all emergency LSCS which were done with indication of fetal distress due PROM, meconium stained liquor. In the study by Adatara et al showed that neonates with birth weight less than 1.5 Kg were 2 and a half times more likely to have neonatal sepsis as compared to those with normal birth weight, greater than 2.5Kg.<sup>21</sup>

Incidence of hyperbilirubinemia was similar in both the groups in the present study. This was because most of the neonates were preterm, and low birth weight and due to low functional ability of liver resulting in inefficient clearance of bilirubin, cause its accumulation and Neonatal hyperbilirubinemia.

In the present study IVH was more commonly associated with vaginal delivery (6%) compared to caesarean section (2%) similar to the studies by Darjan K et al<sup>22</sup> and Humberga et al<sup>23</sup> prevalence of IVH was higher, in vaginal delivery group as compared to caesarean section groups. They also concluded that incidence of IVH was more in emergency caesarean when compared to planned caesarean section. In the present study neonates who had IVH, had birth weight <1500 gms and were premature which are strong risk factors for IVH in case of vaginal delivery. One case in caesarean delivery group had IVH, in whom emergency caesarean section was done with indication of eclampsia and severe IUGR.

In the present study NEC was more commonly seen in caesarean section group (4%) compared to vaginal delivery group (2%). In the present study neonates delivered by caesarean delivery were more premature, were smaller (< 2kg), were more likely to be small for gestational age in view of PIH and had a higher frequency of proven sepsis compared to those who delivered vaginally which are risk factors for NEC. Different new born bacterial colonization due to caesarean delivery as opposed to vaginal delivery has been implicated as one potential contributing factor.<sup>24</sup>

In the present study, neonatal mortality was slightly more in vaginal delivery (16%) group compared to caesarean delivery group (8%). This was because, in the present study complications like birth asphyxia, sepsis, IVH which were

common causes of neonatal mortality were more in vaginal delivery group.

In the present study there was no statistically significant difference of early neonatal outcome between the two study groups similar to several studies in the literature.<sup>2,4,18–20,25</sup>

Birth asphyxia was the most common cause of death.3 babies in vaginal group and two babies in caesarean delivery group had mortality due to Birth asphyxia in the present study. The babies had episodes of seizures and had Hypoxic ischemic encephalopathy grade 2 and 3 and had neonatal mortality.

All the neonates who had IVH had neonatal mortality in both the groups (3 in vaginal group and 1 in caesarean delivery group). It was the 2nd most common cause of neonatal mortality after birth asphyxia in the present study.

One death in each group occurred due to respiratory distress syndrome in the present study. The babies were extremely low birth weight (<1 kg) and were on mechanical ventilation and death occurred on 3rd day of life.

One neonatal death had occurred in vaginal delivery group due to sepsis.

## 6. Conclusion

From this study it can be concluded that:

1. Caesarean delivery offers no short-term survival advantage compared with vaginal delivery for LBW vertex presenting foetuses in hypertensive disorders complicating pregnancies.
2. Neonatal outcomes are not worsened by spontaneous or induced vaginal delivery in women with hypertension with good control and also decreases morbidity due to caesarean section to the mother.
3. Caesarean delivery was found to decrease the risk for intraventricular haemorrhage, Birth Asphyxia, and NICU admissions. However, the decrease was not statistically significant and the long-term neurologic impact remains unknown. Pulmonary complications like respiratory distress syndrome was more common in caesarean delivery.

## 7. Source of Funding

None.

## 8. Conflict of Interest

The authors declare that there is no conflict of interest.

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