



## IMPACT OF PREGNANCY INDUCED HYPERTENSION ON ANTHROPOMETRIC MEASUREMENTS OF A NEWBORN AT BIRTH

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### ABSTRACT

**Study design:** Observational, cross sectional study.

**Background:** Pregnancy induced hypertension remain amongst the most significant and intriguing unsolved problem in obstetrics. It leads to preterm birth, intrauterine growth restriction (IUGR), perinatal death, antepartum hemorrhage and maternal death. This study was conducted to determine the impact of pregnancy induced hypertension on anthropometric measurements of a newborn at birth.

**Method:** The present study was conducted over a period of 18 months on newborns of mothers with Pregnancy Induced Hypertension admitted in Department of Obstetrics & Gynaecology and received in department of Pediatrics in Sri Guru Ram Das University of Health Science, Sri Amritsar. It was an observational study in which newborns of mothers with pregnancy induced hypertension were taken up as subjects to determine the weight, height, head circumference and length at birth. A total of 80 pregnant women with PIH were enrolled in this study following the inclusion and exclusion criteria.

**Results:** In 80 pregnant females with PIH, most of the cases were of preeclampsia (51%), followed by gestational hypertension (43%). 54% of total PIH mothers delivered preterm babies. Mean weight, head circumference and length of babies were significantly affected by the severity of PIH. 56% newborns had normal birthweight.

**Conclusion:** It was observed that length followed by head circumference and weight were significantly affected by the severity of PIH in mothers.

**Keywords :** Pregnancy Induced Hypertension, Gestational Hypertension, Preeclampsia, Eclampsia

### INTRODUCTION

Fetal outcome depends on many maternal and fetal factors. Pregnancy induced hypertension is one of the maternal diseases that causes the most detrimental effects to the maternal, fetal and neonatal organisms.<sup>1</sup> PIH is the second most common medical disorder seen during pregnancy. Hypertensive disorders of pregnancy, is an umbrella term that includes preexisting and gestational hypertension, preeclampsia, and eclampsia, complicate up to 10% of pregnancies and represent a significant cause of maternal and perinatal morbidity and mortality globally.<sup>2</sup> Pregnancies complicated by hypertension are associated with increased risk of adverse fetal, neonatal and maternal outcomes.<sup>3</sup>

Pre-eclampsia has a complex pathophysiology, the primary cause being abnormal placentation. Defective invasion of the spiral arteries by cytotrophoblast cells is observed during pre-eclampsia. The magnitude of defective trophoblastic invasion of the spiral arteries correlates with the severity of the hypertensive disorder.<sup>4</sup>

Fetal risk is related to the severity of PIH, duration of disease, and degree of proteinuria. The major cause of fetal compromise occurs as a consequence of reduced uteroplacental perfusion.<sup>5</sup> The immediate impact observed is altered fetal growth. Fetal health as well as fetal weight are highly compromised, leading to various degree of fetal morbidity, and fetal damage may be such as to cause fetal death. The offspring of women with hypertension during pregnancy experience higher rates of prematurity and low birth weight.<sup>6</sup> The risks posed by the preeclampsia to the fetus include intrauterine growth retardation, intrauterine death, accidental hemorrhage, low birth weight, fetal distress, hypoxemia, acidosis, low APGAR score, premature birth, NICU admissions and early neonatal death.<sup>7,8</sup> The only causal treatment for hypertensive disorders of pregnancy is to deliver the baby. The changes in fetal growth are assessed by means of anthropometric measurements, such as, birth weight and gestational age. Neonates with low birth weight are those born with less than 2500g, regardless of gestational age.

### MATERIALS AND METHODS

An observational study was carried out on newborns of mothers with Pregnancy Induced Hypertension admitted in department of Obstetrics & Gynaecology and received in department of Pediatrics during a period of 18 months from 1<sup>st</sup> February 2019 to 31<sup>st</sup> July 2020 in SGRDIMS, Sri Amritsar. Approval was obtained from the Institutional Thesis and Ethical Committee. Informed consent was taken from the parents of neonates under study.

Following criteria was taken for PIH:

**Hypertension** with systolic blood pressure more than 140 mm Hg and diastolic blood pressure > 90 mm Hg or rise of atleast 30 mm Hg of systolic pressure and 15 mm Hg of diastolic pressure over previously known blood pressure. The rise of blood pressure must manifest on atleast 2 occasions 6 hrs or more apart.

**Proteinuria:** Presence of 300 mg or more proteins in 24 hr urine collection or protein concentration of 1gm/l or more in atleast two random urine specimens collected 6 or more hours apart. Gestational hypertension is hypertension arising de novo after 20 weeks' gestation in the absence of proteinuria and without biochemical or haematological abnormalities.

**Pre-eclampsia:** presence of de novo hypertension after 20 weeks of gestation accompanied by proteinuria and/or evidence of maternal acute kidney injury (AKI), liver dysfunction, neurological features, hemolysis or thrombocytopenia, or fetal growth restriction. Pre-eclampsia when complicated with convulsion or coma was taken as Eclampsia.<sup>9</sup>

**Gestational age** was calculated from the first day of LMP of mother. Neonates with gestational age < 37 weeks were considered pre-term, 37-41 weeks as term and ≥ 42 weeks as post-term.

**Birth Weight:**

Weight of the nude child was recorded with Equinox EQ-BE-55 Baby Weighing Scale-Digital machine. On the bases of birth

weight, neonates were classified into:  
 Low Birth Weight (LBW) < 2500 gm  
 Very Low Birth Weight (VLBW) < 1500 gm  
 Extremely Low Birth Weight (ELBW) < 1000 gm

**LENGTH:** It was recorded on infantometer with child supine, straightened legs, feet at right angle to the legs with toes pointing upwards.

**HEAD CIRCUMFERENCE:** Occipito-frontal head circumference was measured with the help of measuring tape.

**CHEST CIRCUMFERENCE:** It was measured at the level of nipples with the help of measuring tape.

**INCLUSION CRITERIA:**

- 1) All the newborns of mothers suffering from pregnancy induced hypertension, delivered either by normal vaginal delivery or by caesarean section at SGRDIMSR, Sri Amritsar.

**EXCLUSION CRITERIA:**

- 1) Neonates with multiple congenital anomalies (congenital, neuromuscular, cardiac and pulmonary disorders)
- 2) Neonates referred from other hospitals

The data collected was analyzed statistically with SPSS Statistics-26 version to draw relevant conclusions. For non-parametric data, chi square test was applied. For parametric data student t-test was applied. The level of significance was determined as its 'P-value' with p-value > 0.05 as insignificant, < 0.05 as significant and < 0.001 as highly significant. The following observation was made.

**RESULTS**

A total of 80 pregnant women with PIH participated in this study. Out of which 34(43%) cases had gestational hypertension, 41(51%) had pre-eclampsia and 5(6%) had eclampsia. It was observed that most of the cases were of preeclampsia.

Maturity was assessed in 79 cases as 1 case of intrauterine death was excluded. There were 36(46%) term, 17(21%) early preterm and 26(33%) late preterm thus total 43(54%) preterm neonates. It was observed that most of the neonates were preterm.

**Table-1 Relationship of Anthropometric Measurements of Neonates with Severity of PIH In Mothers**

Total Patients	Gestational Hypertension Mean±SD	Preeclampsia Mean±SD	Eclampsia Mean±SD	P-value
Mean Weight (kg)	2.56±0.71	2.12±0.82	1.98±0.36	0.046
Mean Length (cm)	45.79±4.22	43.97±5.13	45.85±4.31	0.000
Mean Head Circumference (cm)	32.51±2.04	31.23±2.95	31.25±2.72	0.035
Mean Chest Circumference (cm)	29.67±2.03	27.81±3.25	27.63±4.33	0.236
Data presented as Mean±SD				

Above table depicts that mean weight of neonates delivered by PIH mothers was 2.56±0.71 in gestational hypertension, 2.12±0.82 in preeclampsia, and 1.98±0.36 in eclampsia group. Weight of the neonate was significantly associated with severity of the PIH in mothers (p-value=0.046). Mean length of neonates was 45.79±4.22 in gestational hypertension, 43.97±5.13 in preeclampsia and 45.85±4.31 in

eclampsia group. There was a highly significant correlation between neonatal length and severity of PIH in mothers (p-value=0.000). Mean head circumference of neonates was 32.51±2.04 in gestational hypertension, 31.23±2.95 in preeclampsia and 31.25±2.72 in eclampsia group. Head circumference of neonate was significantly associated with the severity of PIH in mothers (p-value=0.035). In gestational hypertension, preeclampsia and eclampsia group the mean chest circumferences of neonates were 29.67±2.03, 27.81±3.25, and 27.63±4.33 respectively. Correlation between chest circumference of neonates and the severity of PIH in mothers was not significant (p-value=0.236). It was observed that length followed by head circumference, and weight were significantly affected by severity of PIH in mothers.

**Table-2: Distribution of Anthropometric Measurements of Neonates**

Anthropometry	Preterm Mean±SD	Term Mean±SD	P-Value
Weight (kg)	1.77±0.58	2.93±0.45	0.000
Length (cm)	41.85±3.9	48.43±2.81	0.000
Head Circumference (cm)	30.06±2.27	33.85±1.07	0.000
Chest Circumference (cm)	26.72±2.33	30.85±1.86	0.000

Above table shows that mean birth weight was 1.77±0.58 kg in the preterm and 2.93±0.45 kg in term neonates. Mean length in preterm and term neonates was 41.85±3.9 and 48.43±2.81 cms. respectively. Mean head circumference in preterm and term neonates was 30.06±2.27 and 33.85±1.07 cms. respectively. Preterm and term neonates had chest circumference of 26.72±2.33 and 30.85±1.86 cms. respectively. It was observed that association of anthropometric measurements i.e. weight, length, head circumference and chest circumference with neonatal maturity was highly significant as per the fact (p-value=0.000).

**Table-3: Correlation between Birth Weight of Neonate and Severity of PIH In Mother**

Birth Weight	Total		Gestational Hypertension		Preeclampsia		Eclampsia		P-Value
	n	%	n	%	n	%	n	%	
NBW	44	56%	24	71%	19	47%	1	25%	0.000
LBW	22	28%	7	20%	12	29%	3	75%	
VLBW	9	11%	2	6%	7	17%			
ELBW	4	5%	1	3%	3	7%			
Total	79	100%	34	100%	41	100%	4	100%	

Above table shows that 44 (56%) neonates were normal birth weight, 22 (28%) low birth weight, 9 (11%) very low birth weight, and 4 (5%) extremely low birth weight. Gestational hypertension group had 24(71%) NBW, 7(20%) LBW, 2(6%) VLBW, and 1(3%) ELBW neonates. Preeclampsia group had 19(47%) NBW, 12(29%) LBW, 7(17%) VLBW, and 3(7%) ELBW neonates. Eclampsia group had, 1(25%) NBW and 3(75%) LBW neonates. Correlation between birth weight of neonates and severity of PIH in mothers was highly significant (p-value=0.000). It was observed that most of the neonates in gestational hypertension and preeclampsia groups were NBW and those in eclampsia group were LBW.

**DISCUSSION**

The term 'Pregnancy Induced Hypertension' includes gestational hypertension, preeclampsia, and eclampsia. It complicates up to 10% of pregnancies. Pregnancies complicated by hypertension are associated with increased risk of adverse fetal, neonatal and maternal outcomes.<sup>3</sup>

In our study, out of 80 pregnant females with pregnancy induced hypertension, 34(43%) cases were of gestational hypertension, 41(51%) cases of preeclampsia and 5(6%) cases of eclampsia. It was observed that most of the cases had preeclampsia. Sajith M et al also observed that preeclampsia was the most common cause of hypertension during

pregnancy i.e. 40(71.2%) cases. This was followed by gestational hypertension with 20(19.2%) cases and eclampsia with 8(7.7%) cases.<sup>3</sup> In a study conducted by Kolluru V et al there were 63(27.3%) cases of gestational hypertension, 146(61.6%) cases of preeclampsia and 25(11.1%) had eclampsia.<sup>10</sup> Our study matches with the studies mentioned, concluding that preeclampsia is most common among pregnancies with PIH.

Mothers with PIH gave birth to 36(46%) term and 43(54%) preterm neonates of which 17(21%) were early preterm and 26(33%) were late preterm neonates. It was observed that most of the neonates delivered by mothers with PIH were preterm. Similarly, in a study done by Hassan M et al 16 (26.66%) neonates were delivered term and 44 (73.33%) preterm of which 14 (23.33%) were early preterm and 30 (50%) late preterm.<sup>6</sup> Tesfaye AG et al also observed in their study that 16 (48.5%) neonates delivered by mothers with PIH were term and 17 (51.5%) were preterm neonates.<sup>11</sup> So, premature neonates are delivered by most of mothers with PIH.

In the present study, difference in birth weight, length and head circumference were found to be significant between gestational hypertension, preeclampsia and eclampsia groups. There was no significant difference in the chest circumference of neonates in these groups. Length followed by head circumference and weight of the neonates were most affected by the severity of PIH in mothers. No comparative data was available to corroborate with our findings.

In our study, difference in birth weight, length, head circumference and chest circumference were significant between preterm and term neonates as per the fact.

There were 44(56%) NBW, 22(28%) LBW, 9(11%) VLBW and 4(5%) ELBW neonates. Similarly, in a study done by Tesfaya AG et al, 69.7% were NBW, 24.2% were LBW and only 6.1% were VLBW neonates.<sup>11</sup> Vats K et al in their study observed that majority of cases (68.4%) delivered NBW neonates, while 25.5% cases delivered LBW and 6.1% delivered VLBW neonates.<sup>8</sup> Our study matches with the studies mentioned above concluding that most of the neonates delivered by PIH mothers are NBW.

In present study, 71% neonates in gestational hypertension group were NBW and most of the neonates i.e. 75% neonates in eclampsia group were LBW. It was observed that severity of PIH in mothers significantly affected the birth weight of neonates (p-value=0.000). Similarly, Kheir A et al in their study observed that there was significant correlation between the birth weight and type of hypertensive disorder in pregnancy (p-value=0.01).<sup>12</sup> Odegard RA et al in their study also concluded that birth size was lower with increasing severity of preeclampsia (p-value < 0.01).<sup>13</sup>

## CONCLUSION

PIH is one of the major cause of maternal, fetal and neonatal morbidity and mortality. Among pregnancy induced hypertension, preeclampsia was the most common. There is an increased risk of preterm delivery, IUGR, NICU admission, respiratory distress, sepsis, early neonatal death in neonates delivered by mothers with PIH. Increased incidence of LBW was found as severity of PIH increased. Early diagnosis and treatment through regular antenatal checkup is the key factor to prevent neonatal morbidity and mortality.

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