

## Study on Placenta in Hypertensive Disorders of Pregnancy

Dixit Daksha P.<sup>1</sup>, Vanitha<sup>2</sup>, Virupaxi Rajendrakumar D.<sup>3</sup>

### Abstract

*Introduction:* Hypertensive disorders are the causes of maternal and fetal mortality and morbidity. Ten percent of pregnancies are affected by hypertensive disorders. This study is aimed at studying the morphological and morphometrical changes of the placenta in hypertensive disorder and their effects on fetal growth and to compare them with the normal pregnancy. *Methodology:* Live birth placentae were collected from hypertensive and normal pregnancy (30 in each group). Morphometric measurements of placentae along with morphological changes were recorded. Fetal parameters and maternal history were recorded after the delivery. *Results:* Morphometric parameters of the placentae were reduced in hypertensive disorder which was statistically significant ( $p < 0.05$ ) and also morphological changes were observed. Fetal weight and length were also reduced. In hypertensive group, the majority of women had a Caesarean section (C/S) which was statistically significant. *Conclusion:* In this study, we observed that hypertensive disorders will affect the placental morphology and its function thereby affecting the fetal growth. Knowledge of placental and fetal insufficiencies in hypertensive disorder can help to manage and improve the antenatal care of future pregnancy, and management of fetus and mother after delivery.

**Keywords:** Hypertension; Morphology; Morphometry; Placenta; Pregnancy.

### Introduction

Ten percent of pregnancies worldwide are complicated by the hypertensive disorders of pregnancy, including pre-eclampsia, which is one of the greatest causes of maternal and perinatal morbidity and mortality. Hypertensive disorders are classified as pre-eclampsia, eclampsia, chronic hypertension, chronic hypertension superimposed preeclampsia and gestational hypertension [1]. Placentation defects like the failure of trophoblast invasion and spiral artery remodeling, which impede the uteroplacental circulation are said to be the main causes of pre-eclampsia [2]. Still, the etiology of pre-eclampsia is unknown. The placenta is discarded after the delivery, but an examination

of the placenta will explain the prenatal events, maternal and fetal health [3]. This further can help to improve the antenatal care in future pregnancy. This study has been taken up to see the morphological and morphometrical changes of the placenta in hypertensive disorder and their effects on fetal growth and to compare them with the normal pregnancy.

### Methodology

Placentae of live births were collected from Department of Obstetrics and Gynaecology, Dr. Prabhakar Kore Charitable Hospital, Belagavi, after taking consent from the pregnant women. We collected 30 placentae with a history of the hypertensive disorder (study group) and 30 normal (control) placentae for the study. First, the placenta was observed for cord and membrane attachment, then the membrane and cord were trimmed, and placental weight, volume and surface area were measured. Fetal parameters like birth weight, sex, gestational age and maternal history were also recorded.

**Author's Affiliation:** <sup>1</sup>Professor <sup>2</sup>Ph.D.Scholar <sup>3</sup>Professor and Head, Department of Anatomy, Jawaharlal Nehru Medical College, KLE Academy of Higher Education & Research (KAHER), Belagavi, Karnataka 590010, India.

**Corresponding Author:** Vanitha, Ph. D. Scholar, Department of Anatomy, Jawaharlal Nehru Medical College, KLE Academy of Higher Education & Research (KAHER), Belagavi, Karnataka 590010, India.

E-mail: [vanithasanjeev@gmail.com](mailto:vanithasanjeev@gmail.com)

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## Results

In this study, 30 cases were normal and 30 were from hypertensive disorders (Fig. 1). In hypertensive disorder, the mean age of the pregnant women was  $26.11 \pm 5.06$  and in normal it was  $23.81 \pm 2.24$  which was statistically significant i.e.  $p$ -value was 0.008247 ( $p < 0.05$ ). In the study group, 42.86% had a normal delivery and 57.14% under went cesarean section. The difference between them was statistically significant ( $p < 0.05$ ). In control group, 50% had a normal delivery and 50% had C/S sections. The distribution of hypertensive disorder group is given in the Table 1.

**Table 1:** Distribution of hypertensive cases

Hypertensive disorders	Number of cases	Percentage
Gestational hypertension	15	50
Pre-eclampsia	12	40
Eclampsia	3	10
Total	30	100



**Fig. 1:** Placenta of hypertensive disorder

### Fetal Parameters

Out of 30 study group, 46.43% were male babies and 53.57% were female babies. In normal, 36.68% were male babies and 63.33% were female babies. Fetal variables with the measurements are shown in Table 2.

Gestational age, birth weight, length of the baby were lesser in hypertensive group than the normal and it was statistically significant ( $p < 0.05$ ).

### Placental Parameters

Placental morphometric and morphological measurements are shown in Table 3.

Placental weight, volume and the number of cotyledons were lesser in hypertensive group than

the normal and it was statistically significant  $p < 0.05$ .

Eccentric, marginal, velamentous cord attachment (Figure 3) were more in hypertensive group than the normal and central attachment was lesser in hypertensive group than the normal.

Circummarginate and circumvallate attachment of the membrane were more in hypertensive group than the normal.

### Morphological changes of the placenta

In this study, one placenta in the hypertensive group showed bilobed placenta (Figure 2). Infarction and calcium salts deposition were more in hypertensive pregnancy compared to normal pregnancy.

### Fetoplacental weight ratio (FP)

FP ratio was 6.02:1 in normal group and 6.57:1 in hypertensive group.



**Fig. 2:** Bilobed placenta



**Fig. 3:** Velamentous cord attachment

**Table 2:** Showing distribution of fetal variables

S. No.	Variables of fetus	Normal group		Hypertensive group		Significance (p<0.005)
		Mean	SD	Mean	SD	
1	Gestational age (in weeks)	39.11	1.14	37.93	2.18	p=.003189
2	Birth weight of the baby (in gms)	2906.65	307.50	2668	455.78	p=.007175
3	Length of the baby (in cm)	49.97	2.37	48	3.63	p=.013981

**Table 3:** Showing distribution of placental morphometric and morphological measurements

S. No.	Variables of placenta	Normal group		Hypertensive group		Significance (p<0.005)
		Mean	SD	Mean	SD	
1	Weight of placenta (in gms)	482.63	83.80	405.78	75.13	p=.000151
2	Volume of the placenta (in ml)	466.76	76.92	401.79	76.85	p=.000637
3	Number of cotyledons	22.37	4.94	19.39	3.78	p=.006662
4	Attachment of cord	Central=16.67% Eccentric=66.67% Marginal=13.33% Velamentous=3.33%		Central=3.33% Eccentric=73.33% Marginal=16.67% Velamentous=6.67%		
5	Membrane attachment	Membranous=86.67% Circummarginate=6.67% Circumvallate= 6.67%		Membranous=63.33% Circummarginate=16.67% Circumvallate= 20%		
6	Infarction and calcified area	No infarction and calcium salts=66.67% Infarction and calcium salts=33.33%		No infarction and calcium salts=60% Infarction and calcium salts=40%		

## Discussion

In the present study, we collected 60 placentae. Out of them, 30 were from normal pregnancy and remaining 30 were from pregnancy with hypertensive disorders. Out of 30 hypertensive cases, 15 were from gestational hypertension, 12 were from pre-eclampsia and 3 were from eclampsia. In this study, statistically significant (p<0.05) difference in the age of the mother was observed between the control (23.81 ± 2.24) and study group (26.11 ± 5.06). In hypertensive group, incidence of C/S was more than control. Similar results were found in a study done by Singh S et al. [4]. In our study, placental parameters like weight, volume were significantly reduced in hypertensive group compared to normal (p<0.05). Similar results were observed by Gowda P et al. [5], Majumdar S et al. [6], Londhe PS et al. [7], Keche HA et al. [8] and Goswami PR et al. [9]. The number of cotyledons was significantly reduced in hypertensive group. Singh S et al. [4] and Londhe PS [7] also reported a reduction of cotyledons in hypertensive disorder. The hypertensive disorder may affect the growth of stem villous of the placenta which corresponds to cotyledons [5]. Attachment of the cord was more eccentric, marginal and velamentous in hypertensive disorders than the normal. But the central attachment was lesser in hypertensive group than

in the normal group. Goswami PR et al. reported more eccentric and marginal, and less central attachment of cord in hypertensive disorder [9]. Majumdar S et al. reported more marginal cord attachment in hypertensive disorder [6]. In another study, the cord was more eccentric in hypertensive disorder [10]. In our study, membrane attachment of the placenta was more circumvallate, circummarginate and less membranous in hypertensive group as compared to normal group. Infarction and calcified areas were more in hypertensive pregnancies compared to normal pregnancies. Singh S et al. [4], Ranga MK et al. [11], Gowda P [5], Londhe PS et al. [7] and Goswami PR et al. [9] observed similar features in their study. We also observed bilobed placenta in hypertensive disorder. In the present study, fetoplacental weight ratio was more in hypertensive disorder. Similar observations were made by Majumdar S et al. [6] and Gowda P et al. [5], while other studies reported decreased fetoplacental ratio [7,8,12].

The gestational age of normal and hypertensive groups was statistically significant (p<0.05) in this study. The mean gestational age in hypertensive group was 37.93±2.18 and in normal group, it was 39.11±1.14 which showed the difference in two groups. The birth weight of the fetus was reduced significantly in hypertensive group compared to

normal group. Earlier studies also reported similar findings [4,5,7,8,11,12]. We also observed a reduction in the length of the fetus in hypertensive group than normal group, which was statistically significant ( $p < 0.05$ ). In our study, we observed that there is a reduction in the placental morphometry and morphology, and also a reduction in fetal weight and length. With the help of these observations we can say that hypertensive disorders affect placental morphology and its function, thereby reducing the fetal growth, thus increasing the maternal and fetal morbidity and mortality.

### Conclusion

In the present study, we observed the morphology and morphometry of placenta and fetal parameters in normal and hypertensive pregnancies. There was a significant reduction in placental morphometry and fetal parameters. Knowledge of placental and fetal insufficiencies in hypertensive disorder can help to manage and improve the antenatal care for future pregnancy and also in the management of fetus and mother after delivery.

### Key Messages

Hypertensive disorders affect placental morphology and its function, thereby reducing the fetal growth, thus increasing the maternal and fetal morbidity and mortality.

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*Conflicting Interest:* Nil

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