



## MORPHOMETRIC STUDY OF PLACENTA IN NORMAL AND HYPERTENSIVE PREGNANCIES

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### ABSTRACT

**Background** – Placenta is a vital organ which is directly related to maintenance of pregnancy and normal fetal growth. Fetal outcome is adversely affected by changes in placenta due to hypertension complicating pregnancy.

**Methods** – A study was conducted in Department of Anatomy Kakatiya Medical College Warangal. Total 200 placentae were collected, 100 from normal pregnancies (control) and 100 from pregnancies complicated by hypertension (study). Morphometric parameters like shape, weight, thickness and calcifications are noted.

**Results**- The morphometric parameters like weight, and thickness are significantly low in pregnancies complicated by hypertension than normal pregnancies. Calcifications in study group are more.

**Conclusion**- Placenta in pregnancies complicated by hypertension are found to have significantly low weight, diameter, thickness and they found to have more calcifications which directly influence the outcome of pregnancy

**KEYWORDS :** .placenta, morphometry, pregnancy induced hypertension

### INTRODUCTION

The intrauterine existence of fetus is dependent on one vital structure 'THE PLACENTA'. Placenta is an important organ for maintaining pregnancy and promoting normal fetal development.<sup>(1)</sup>

Placenta undergoes different changes in weight, volume, structure, shape and function continuously throughout the gestation to support the prenatal life.<sup>(2)</sup>

Placenta is a special characteristic feature of higher mammals, and is connected to the uterus and is connected to the fetus, through the umbilical cord.<sup>(3)</sup>

Pregnancy complications like hypertension or gestational diabetes are reflected in the placenta in a significant way, both macroscopically and microscopically. It has been recorded that the maternal in-utero placental blood flow is decreased in hypertension complicating pregnancies due to maternal vasospasm, leading indirectly to constriction of fetal stem arteries which is associated with the changes seen in the placentas.<sup>(4)</sup>

Being an organ of vital importance for continuation of pregnancy and fetal nutrition, placenta has evoked great interest among pathologists & obstetricians, much work has been done to understand the unique biological status of this complex organ.<sup>(5)</sup>

Since all the anabolites needed for fetal metabolism come from mother's blood and fetal catabolites are passed back into the mother's circulation through placenta, the examination of placenta gives a clear idea of antenatal and postnatal condition of fetus<sup>(1)</sup>.

Examination of the placenta prenatally by ultrasonography or postnatally by gross and microscopic study may provide clinical information about the causes of IUGR, placental dysfunction, fetal distress and death, and neonatal illness.<sup>(6)</sup>

The present study is carried out to compare the different parameters of placentae of normal pregnancies and of pregnancy induced hypertension cases.

### MATERIALS AND METHODS

This study is conducted in Department of Anatomy, Kakatiya medical college and Govt. Maternity Hospital Hanamkonda, Warangal.

The material for the present study consists of placentae collected from 100 normotensive (control) and 100 hypertensive (study) pregnancies. The case history and blood pressure history is obtained from case sheets of patients. Those women who had blood pressure more than

140/90 mm of Hg at least in two occasions were taken as hypertensive group.

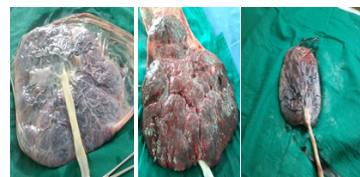
### Collection of material

The placenta, with attached membranes and umbilical cord, is collected soon after delivery. Placenta is washed in running tap water to clean all blood clots and blood. Placenta with cord is preserved in 10% formalin. Gross features of placentae are noted. Parameters like shape, weight, diameter and thickness are noted; photographs of placentae are preserved in normotensive and hypertensive women and presented in the form of tables

### OBSERVATIONS AND RESULTS

#### Shape of placenta

The shape of the placentae varies from circular, oval and lobed (figure no.1). The majority of placentae are circular than oval, in both normal and hypertensive group. The hypertensive group show high prevalence of oval shaped placentae. One bi-lobed placenta was observed in normal group. Shape of placenta when compared statistically in two groups was not found to be significant. (table no.1)



**Figure no.1-- Different shapes of placenta (irregular, bilobed and rounded)**

**TABLE NO.1**

**Shape of placentae in two groups**

Groups	Circular	Oval	Bilobed
Normal	87	12	1
Hypertensive	79	21	0

#### Weight of the placenta :

Weight of the placentae of two groups is measured and mean weight calculated. Placentae from hypertensive group weigh less than those from normotensive group. The least weight recorded in hypertensive group is 430 gm and highest being 680 gm. Whereas the normotensive placentae have least weight 450 gm and highest being 790 gm (figure no.2). The mean weight of normal group is 616.82 gm  $\pm$  SD 86.53 and of hypertensive group is 562.36 mg  $\pm$  SD 60.85. (Table no.2).

p-value is <0.0001 which is very significant.

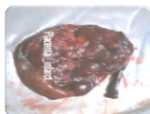
**TABLE NO.2**

Weight of placenta in two groups

Groups	>550gm	550gm	<550gm	Total
Normal	68	8	24	100
Hypertensive	53	9	38	100
Total	121	17	62	200



large placenta in normal pregnancy



small placenta with less weight in Pregnancy induced hypertension

**Figure no.2- large and small placentae**

**Figure no.2- large and small placentae**

**Thickness of placenta**

Thickness of placenta is significantly reduced in hypertensive group. The normal group have a mean thickness of 2.9 cm ± 0.2551, with maximum thickness 3.8 cm and minimum 2.2 cm. The hypertensive group has mean thickness of 2.091 cm ± 0.2240, with maximum thickness of 2.8 cm and minimum of 1.4 cm. The variation of thickness of placenta in both groups is statistically very significant with p-value <0.0001.

**TABLE NO. 3**

Thickness of placentae in two groups

Groups	>2.5cm	<2.5cm	Total
Normal	93	7	100
Hypertensive	6	94	100

**Presence of calcifications**

Presence of calcifications is a more frequent feature in hypertensive group. The calcifications are present in 26 placentae in hypertensive group and in 10 placentae in normotensive group (Table no.4) (Figure no.3). The appearance of calcifications in hypertensive group in comparison with normal group is statistically very significant with p-value 0.0058.

**TABLE NO. 4**

Incidence of calcifications on placentae in two groups

Groups	Presence of calcifications	Absence of calcifications
Normal	10	90
Hypertensive	26	74

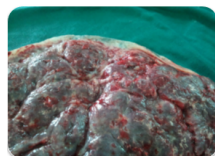


figure no.3- Calcifications on maternal side of placenta

**DISCUSSION**

Placenta being a fetal organ shares the same stress and strain to which the fetus is exposed. Thus any disease process affecting the mother and fetus also has a great impact on placenta. A glance at the literature reveals that hypertension induced in pregnancies exert its deleterious effects upon the placenta.

The present study was undertaken to analyze and assess the morphometric variations of placenta in normal and hypertensive pregnancies.

A total of 200 placentae were studied, which included 100 placentae from uncomplicated full term deliveries considered as normotensive [control] group, and 100 placentae from pregnancy induced hypertension group considered as hypertensive [study] group. Morphometric parameters of placenta like weight and thickness are

significantly reduced in hypertensive group compared to normotensivel group.

**SHAPE OF THE PLACENTA**

The shape of placenta varies from circular, oval and irregular. The oval shaped placentae are more prevalent in hypertensive group than in the normal group. In normal group circular shaped placentae are 88% and oval shaped 12%. In hypertensive group the circular placentae are 79% and oval shaped 21%. The variation between the two groups is statistically not significant. Chi square test P-Value 0.1275 is not significant.

Majumdar S Dasgupta et al carried out study on fifty mothers with uncomplicated pregnancy and fifty mothers with pregnancy induced hypertension (PIH) and found that mothers with moderate to severe PIH had smaller, irregular placentae.<sup>(4)</sup>

These results correlate with the results of previous workers like Segupta Kishwara and Nobis & Das who found that shape of the most placentae were oval (40%) in preeclampsia group and most being circular (43.3%) in control group.

**WEIGHT OF PLACENTA**

In present study the mean placental weight of normal group is 616 gm ± 86 with maximum weight 740 gm and minimum 450 gm. In hypertensive group the mean placental weight is 562 gm ± 60 with maximum 680 gm and minimum 430 gm. Thus there is a reduction of placental weight in hypertensive group than in the normal group which is statistically significant. (P value <0.0001).

The placental weight is significantly low in hypertensive group compared to normal group. This has similarities to the studies done by previous workers (Table no. 5).

**TABLE NO. 5**

Comparative study of mean placental weight between various authors

Sl. No.	Author name	Mean weight of placenta in grams	
		Normal	Hypertensive
1	Pradeep S londe <sup>8</sup>	401.80 ± 54.62	312 ± 70.14
2	Palskar <sup>9</sup>	475	392
3	Udainia <sup>1</sup>	495	435.63
4	Sumit Gupta <sup>10</sup>	415.7	365
5	Majumdar <sup>4</sup>	485.85	399.1
6	Sharmista Ghodke <sup>11</sup>	495	435.63
7	M Zia Ur Rehman <sup>12</sup>	502	293
8	Present study	616.82	562.36

Pradeep Londe has observed that Morphometric parameters of placenta like, weight, volume were significantly lower in hypertensive group as compared to normal group were statistically significant (p<0.01)<sup>(8)</sup>.

Majumdar et al, Palskar, Sumit Gupta et al, observed that the weight of placenta in hypertensive group is significantly lower than the normotensive group<sup>(4,9,10)</sup>.

Udainia.A stated that the placental weight is significantly lowered in pregnancy induced hypertension and also stated that as the hypertension increases, the placental weight decreases<sup>(1)</sup>.

Sharmista et al<sup>(11)</sup>, M Zia Ur Rehman et al<sup>(12)</sup> stated that the weight and volume of the placentae in hypertensive pregnancy is less than the normotensive group.

Akmaq M, Nagi AH et al observed that placental weight in patients of eclampsia & preeclampsia is relatively lower than the normal group<sup>(13)</sup>.

**THICKNESS OF PLACENTA**

The thickness of placenta in hypertensive group is found to be lower than that of normal group. Present study shows placenta in normal group having mean thickness of 2.939 cm ± SD 0.2551 and in hypertensive group 2.091 cm ± SD 0.2240. Maximum thickness in normal group is 3.8cm and minimum is 2.2 cm whereas in hypertensive groups the maximum thickness is 2.8 cm and minimum is 1.4 cm.

The difference in thickness of placenta between the two groups is statistically very significant with P-value < 0.0001. This has similarities with the studies done by previous authors like segupta<sup>7)</sup> and rehman<sup>(12)</sup>, who observed that the thickness of the placenta in hypertensive pregnancies is lesser than normotensive pregnancies (Table no.6).

**TABLE No. 6**

Comparative study of mean placental thickness between various authors

Sl. No.	Author Name	Mean thickness of placenta in cms	
		Normal	Hypertensive
1	Segupta kishwara <sup>7)</sup>	1.59±0.39	1.51±0.37
2	MH Rehman <sup>12)</sup>	2.34±0.04	1.99±0.35
3	Present study	2.939±0.255	2.091±0.224

### PRESENCE OF CALCIFICATIONS

The present study shows that the presence of calcifications in the placenta is more frequent in hypertensive group than in normal group. The normal group has 10% calcifications and hypertensive group have 26%. The statistical variation of this is very significant. Chi square test P-Value 0.0058.

Calcifications are common in human placenta and are recognized as a part of normal aging of this organ. Excessive pathological calcification is seen in pregnancy induced hypertension. Calcium deposits are seen in the villi and basement membrane of the villi which is suggestive of uteroplacental insufficiency due to narrow lumen. In placenta of hypertensive women, the mean calcified areas are more than the normal group. This study correlates with the previous studies (Table no. 7).

Pushpa Goswami & Hemlata S Menon et al observed that excessive placental calcification is seen in pregnancy induced hypertension, placental abruption & IUGR<sup>(14)</sup>.

Nag et al<sup>(15)</sup> compared both the hypertensive and normotensive groups and stated that the presence of calcifications is more in hypertensive group.

The present study findings correlate with the previous works of authors that the presence of calcifications is seen more in hypertensive group.

**TABLE No. 7**

Comparative study of presence of calcifications between various authors

Sl. no.	Author Name	presence of calcifications in percentage	
		Normal	Hypertensive
1	Majumdar <sup>3)</sup>	4.10%	33.30%
2	Pradeep S Londe <sup>8)</sup>	3.68%	11.30%
3	Pushpa Goswami <sup>14)</sup>	2.93%	14.97%
4	Nag et al <sup>15)</sup>	5%	18%
5	Present study	10.00%	26.00%

### CONCLUSION

- A comparative morphometric study of placenta is done between 100 normotensive and 100 hypertensive pregnancies
- The majority of placenta were circular 167 (83.5%) and others were oval 32 (16%) and one placenta was bi lobed.
- The weight of the placenta is reduced in hypertensive group, with mean value of 616.82 gm ± 86.53 gm in normal group, and 562.36 gm ± 60.85 gm in hypertensive group. The least weight recorded in hypertensive group is 430 gm and highest being 680 gm whereas the normotensive placenta have least weight 450 gm and highest being 790 gm.
- The normal group has a mean thickness of 2.9 cm ± 0.2551, with maximum thickness of 3.8 cm and minimum 2.2 cm. The hypertensive group has mean thickness of 2.091 cm ± 0.2240, with maximum thickness of 2.8 cm and minimum of 1.4 cm.
- The presence of calcifications is more prevalent on hypertensive group than on normal group.

Present study concludes that the hypertensive disorders of pregnancy

adversely influence the morphology of the placenta. The lesser weight, thickness and presence of calcifications which are present in hypertensive pregnancies will adversely affect the outcome.

The early measurements of placenta by noninvasive technique like ultrasonography will be helpful in early detection of 'at risk fetus' and will guide for better management of such pregnancies.

**ABBREVIATIONS:** PIH- pregnancy induced hypertension, SD- standard deviation, IUGR- intra uterine growth retardation.

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