



## MORPHOMETRIC STUDY OF THE HUMAN PLACENTA AND IT'S CORRELATION WITH THE PERINATAL OUTCOME

### Anatomy

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### ABSTRACT

**Background:** Placenta acts as a mirror which reflects intrauterine status of fetus. Placenta is considered as a leading cause of maternal and perinatal mortality and important factor affecting foetal growth which is generally associated with placental insufficiency. Pregnancy complications like hypertension or gestational diabetes are reflected macroscopically and microscopically in the placenta.

**Methods:** The study was carried out on 129 placentae which were divided into four groups- normal, pregnancy induced hypertension, anaemia and diabetes mellitus. The various parameters were studied like placental weight, placental surface area, foetal birth weight, placental coefficient, foeto-placental weight ratio, foetal outcome in the form of still birth or alive.

**Results:** It was observed that placental weight was quite low in PIH group than normal. Conversely it was on higher side in Anaemia and Diabetes group. Birth weight of babies show marked reduction in PIH group and Anaemia group, but it is increased in diabetic group. In normal group, stillbirth was observed in 3.33% deliveries. In conditions complicating pregnancy the percentage of still birth is comparatively higher.

**Conclusions:** These conditions also affect the perinatal outcome. Placental parameters are also altered along with foetal parameters like foetal weight. So the diagnosis of such risk factors in pregnancies during antenatal period will improve the outcome.

### KEYWORDS

Insufficiency, Macroscopically, Perinatal, Coefficient

### INTRODUCTION

Placenta is a matter of interest and curiosity for ages for many anatomists, embryologists and obstetricians because of its incomparable importance in the intrauterine development of human being. Placenta acts as a mirror which reflects intrauterine status of fetus. It is the most accurate record of infant's prenatal experiences, so study of placenta and umbilical cord gives valuable clues in cases of adverse fetal outcome. Placenta is considered as a leading cause of maternal and perinatal mortality and important factor affecting foetal growth which is generally associated with placental insufficiency.2 Pregnancy complications like hypertension or gestational diabetes are reflected macroscopically and microscopically in the placenta.

Adverse perinatal outcome is observed in pregnancies which are complicated by one or more conditions. Commonly observed complications are hypertensive disorders, diabetes, twins, etc. Placenta acts as a mirror which reflects intrauterine status of a foetus. It is the most accurate record of infant's prenatal experiences, so study of placenta gives valuable clues in cases of adverse foetal outcome. In this study we tried to compare the parameters which affect the status of the foetus, and are supposed to alter the morphology of placenta.

### MATERIAL AND METHODS

This study was conducted in Department of Anatomy associated with Department of Obstetrics and Gynaecology, Vardhman Institute of Medical Sciences, Pawapuri, Nalanda, Bihar on the 129 placentae obtained from the labor rooms and operation theatres of Obstetrics and Gynaecology department of VIMS, Pawapuri, Nalanda, Bihar. Placentae immediately after delivery were transferred to Research Laboratory of Anatomy department where details were noted. Gross abnormalities of cords and membranes if present, were noted. An accurate weighing was done by trimming off all membranes and cutting umbilical cord 5 cm from its insertion on the placenta. Superficial vessels were drained off the residual blood. Adhered blood clots were removed and placenta was washed under running tap water, dried with the help of blotting paper, weighed in a weighing machine. Weight was noted in grams.

For calculating surface area of the placenta, diameter of the placenta was measured with the measuring scale. At first, the maximum diameter was measured with a metallic scale graduated in centimeters (cm). Then a second maximum diameter was taken at right angles to the first one. The mean of two measurements was considered as the

diameter of the placenta expressed in centimeters. The radius is calculated from diameter.

Formula for Surface area of the placenta =  $\pi r^2$ , where  $\pi = 3.14$

The maternal surface of the placenta was observed by placing the placenta in the white enamel tray and numbers of cotyledons were measured and whether any abnormality in the form of infarction and calcification were examined on the both surfaces of placenta by magnifying lens.

After the examination of placenta and umbilical cord, weight of newborn baby was obtained, foeto-placental weight ratio calculated. Placental coefficient was calculated by dividing placental weight by birth weight of the baby.

Out of total 129 placentae studied, we divided it in four categories according to the risk factors and clinical diagnosis of pregnant women. Diagnosis was done based on the clinical examination done by senior faculty members of the department (associate professors or professors) and laboratory investigations. The four categories were- normal patients without any complications, patients with pregnancy induced hypertension (PIH), patients with anaemia and patients with diabetes mellitus.

Continuous variables were presented as mean  $\pm$  standard deviation. Categorical variables were expressed in percentages.  $P < 0.05$  was considered as statistically significant. Data was analyzed on statistical software Graph Pad Prism 5.01.

### RESULTS

The mean placental weight was found to be  $486 \pm 124$  gm in normal group,  $398 \pm 98$  gm in PIH group,  $504 \pm 133$  gm in anaemia group and  $547 \pm 138$  gm in diabetic group. It was observed that placental weight was quite low in PIH group than normal. Conversely it was on higher side in Anaemia and Diabetes group.

Placental surface area as observed in different groups is also shown in table I. It was markedly increases in Anaemia group and Diabetes group. Birth weight of babies show marked reduction in PIH group and Anaemia group, but it is increased in diabetic group.

Birth weight of babies was the most important parameter in our study. We observed that foetal birth weight is significantly reduced in PIH and anaemia groups compared to normal group. On the other hand it was much higher in diabetes group (Table 1).

**Table 1 : Parameters observed in different groups**

	Normal group (n=30)	PIH group (n=33)	Anaemia group (n=38)	Diabetes group (n=28)
Placental weight (gm)	486±124	398±98	504±133	547±138
Placental surface area (Sq. cm)	223.6±108.5	188.4±89.6	256.9±154.8	286.4±156.9
Birth weight of babies (gm)	2865±170	2267±168	2262±157	3208±189
Placental coefficient	0.17	0.18	0.22	0.17
Feto-placental weight ratio	5.90	5.70	4.49	5.86

Table II is showing the foetal outcome in the form of still birth or alive in different categories. In normal group, stillbirth was observed in 3.33% deliveries. In conditions complicating pregnancy the percentage of still birth is comparatively higher.

**Table 2 : Foetal outcome in different groups**

	Normal group (n=30)	PIH group (n=33)	Anaemia group (n=38)	Diabetes group (n=28)
Alive	29(96.67%)	28(84.85%)	34(89.47%)	24(85.71%)
Still Birth	01(3.33%)	05(15.15%)	04(10.53%)	04(14.29%)

## DISCUSSION

The placenta is said to be a characteristic feature of eutherian or "placental" mammals that connects the developing foetus to the uterine wall to allow nutrient uptake, waste elimination and gas exchange through mothers blood supply. Several studies had conducted in the past regarding the morphology of the placenta. In this study, we tried to compare morphological findings of placenta in different conditions complicating pregnancy like pregnancy induced hypertension, gestational diabetes mellitus and anaemia. We also compared the perinatal outcome (alive or still birth) in these conditions.

We noticed reduction in placental weight in PIH group (398 ± 98 gm) and increased placental weight in anaemia and diabetes groups. The possible explanation can be hypoxia due to anemia and compensatory increase in blood flow which leads to increase in placental weight in anaemia. The weight gain in placenta of diabetic mothers may be attributed to macrosomia and compensatory hyperplasia. Similar findings in diabetic placenta was observed by Pankaj saini et al (2015), Saha et al (2014), Ashfaq et al (2005). The reduced placental weight in hypertensive group may be attributed to reduced blood flow due to ischaemic changes in the vessels. Same findings were also observed by Anjankar et al (2014).

Birth weight of babies was reduced in PIH and Anaemia groups in our study, and increased in diabetes group. The weight gain in placenta of diabetic mothers may be attributed to macrosomia and compensatory hyperplasia. This macrosomia may be attributed to fetal hyperinsulinemia in response to hyperglycaemia in fetuses of diabetic mothers (Queenan JT). Reduced birth weight in PIH group was noted by Anjankar et al (2014), Majumdar et al (2005), Udainia & Jain (2001).

Thomson et al (1969) stated that for the evaluation of foetus, weight of the placenta is not enough, but the foeto-placental ratio is important. Increased foeto-placental ratio in hypertensive pregnancies was previously observed by Thomson et al (1969), Saigal et al (1969), Gunapriya Raghunath et al (2011) and Anjankar et al. Decreased foeto-placental weight ratio was observed Rath et al.

As shown in table II, stillbirths are more common in PIH group (15.15%), Anaemia group (10.53%) and Diabetes group (14.29%) as compared to normal pregnancies (3.33%) which is quiet obvious as these conditions are known to affect the perinatal outcome.

## CONCLUSION

Pregnancy is highly precious for every couple but presence of risk factors in the form of pregnancy induced hypertension, anaemia or diabetes complicates the pregnancy. These conditions also affect the

perinatal outcome. Placental parameters are also altered along with foetal parameters like foetal weight. So the diagnosis of such risk factors in pregnancies during antenatal period will improve the outcome.

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