

## To explore the morphometric examination of placenta in birth weight of full-term newborn babies

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Received: 11-09-2020 / Revised: 20-11-2020 / Accepted: 25-11-2020

### Abstract

**Aim:** The present study was aimed to explore the morphometric examination of placenta in birth weight of full-term newborn. **Materials and methods:** The present study was conducted in Department of Anatomy. Total 100 discarded placentae were collected at random from deliveries (both vaginal and caesarian) conducted Nalanda Medical College and Hospital, Patna Bihar, India for 18 months. 50 out of the 100 placentae were from controls (birth weight > 2500gms) and 50 from low birth weight deliveries (birth weight <2500gms). In the collected placenta, the weight, volume, diameter and thickness of placenta were measured. **Results:** Total 100 placenta which was equally distributed between two groups, group A which included placentae of normal birth weight new born and group B which included placentae of low birth weight newborns. 72% of placenta was birth weight 400-500 gms and followed by 28% >500 gms in group A, and 60 % of placenta was birth weight <400 gms in group B. 46% of placenta was volume 401-499 ml and followed by 28% of placenta was volume ≤ 400 ml in group A and 80% of placenta had ≤ 400 ml volume in group B. The mean placental weight was 465.87±31.67gms in normal birth weight group and 392.71±60.21 gms in the low birth weight group. The mean placental diameter was 19.12±0.88cm in normal birth weight group and 16.83±2.26cm in the low birth weight group. The mean placental thickness was 0.79±0.27cm in normal birth weight group and 1.71±0.27cm in the low birth weight group. The mean placental volume in the normal birth weight group was 439.25± 40.83ml and in the low birth weight group it was 376.24±46.88 ml. The mean foeto-placental ratio in normal birth weight group was 6.24 whereas in low birth weight group, it was 5.22. All the parameter was found to be statistically significant. In the present study the placental coefficient in normal birth weight group was 0.158 ± 0.014 and in low birth weight group was 0.188± 0.031. **Conclusion:** we conclude that the morphometric observation of placenta is associated with foetal weight. This study will also make the physicians and researcher to focus on the placenta.

**Key words:** Birth weight, Placenta, Placental morphometry.

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### Introduction

Children's health is tomorrow's wealth; however, children's health is to a great extent determined by factors that operate in the utero itself, well before they are born. Low birth weight has been defined by the World Health Organization (WHO) as weight at birth of less than 2,500g. WHO estimates that more than 20 million infants worldwide, representing 15.5% of total births, are born with low birth weight, 95.6% of them

are in developing countries. Among the developing countries, India alone accounts for about 30% (8 million) of low birth weight[1]. The Low birth weight mortality rate is about 20 times higher than that of the normal birth weight babies. The various interventions like delaying child bearing in adolescents, efforts to improve the nutritional status of women particularly for those anemic during pregnancy, improving education for the pregnant mother, access to antenatal care were suggested to reduce low birth weight[2] but still an early detection in the weight of the fetus before birth will be beneficial to obstetric and neonatal care to avoid low birth weight babies. Survival, healthy growth and development of foetus in the uterus are mainly

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dependent on the placenta. The placenta is a dynamic organ which maintains fetal homeostasis by performing a wide range of physiological functions, which after birth are carried out by the lungs, gastrointestinal tract, kidney and endocrine glands of the neonate[3]. Placenta undergoes various changes in its weight, surface area, structure, shape and function continuously throughout the gestation to support the growth of fetus in utero. Abnormalities in the placenta eventually result in Low Birth Weight (LBW), Intra Uterine Growth Restriction (IUGR) and still birth which leads to increased rate of perinatal morbidity and mortality [4-6]. The size, morphology and nutrient transfer capacity of the placenta determine the prenatal growth trajectory of the fetus to influence birth weight. Therefore, examination of the placenta will give valuable information about the state of foetal well being and also helpful in the management of complications in mother and the newborn. If the decidual part of the placenta is healthy, the embryogenesis from germinal period up to the end of fetal period will be healthy. There is a proven direct relationship between placental growth, fetal well-being and finally fetal outcome. The present study was aimed to explore the morphometric examination of placenta in birth weight of full-term newborn babies in nalanda medical college and hospital, patna, Bihar,India .

### Materials and methods

The present study was the conducted in Department of Anatomy.Total 100 discarded placentae were collected at random from deliveries (both vaginal and caesarian) conducted Nalanda Medical College and Hospital, Patna Bihar,India for 18 months.

### Methodology

The cases were studied dividing into two experimental groups. 50 out of the 100 placentae were from controls (birth weight > 2500gms) and 50 from low birth weight deliveries (birth weight < 2500gms). In the collected placenta, the weight, volume, diameter and thickness of placenta were measured. The foeto-placental ratio was calculated by dividing the weight of the foetus by

weight of the placenta and the placental coefficient was calculated by dividing placental weight by birth weight. The placenta with attached membranes and umbilical cord was collected soon after delivery washed in running tap water to clean all blood.

Each specimen was tagged with number before commencement of the study, for the purpose of identity.

### Statistical analysis

The recorded data was compiled entered in a spreadsheet computer program (Microsoft Excel 2010) and then exported to data editor page of SPSS version 20 (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics included computation of percentages, means and standard deviations were calculated. Statistical test applied for the analysis were student t-test. Level of significance was set at  $p \leq 0.05$ .

### Results

The present study was done with 100 placenta which was equally distributed between two groups, group A which included placentae of normal birth weight newborns and group B which included placentae of low birth weight newborns. table 2 show that the 72% of placenta had birth weight 400-500 gms and followed by 28% >500 gms in group A, and 60 % of placenta had birth weight <400 gms in group B. 46% of placenta had volume 401-499 ml and followed by 28% of placenta had volume  $\leq 400$  ml in group A and 80% of placenta had  $\leq 400$  ml volume in group B. table 3 show that the mean placental weight was  $465.87 \pm 31.67$  gms in normal birth weight group and  $392.71 \pm 60.21$  gms in the low birth weight group. The mean placental diameter was  $19.12 \pm 0.88$  cm in normal birth weight group and  $16.83 \pm 2.26$  cm in the low birth weight group. The mean placental thickness was  $.79 \pm 0.27$  cm in normal birth weight group and  $1.71 \pm 0.27$  cm in the low birth weight group. The mean placental volume in the normal birth weight group was  $439.25 \pm 40.83$  ml and in the low birth weight group it was  $376.24 \pm 46.88$  ml. The mean foeto-placental ratio in normal birth weight group was 6.24 whereas in low birth weight group, it was 5.22. All the parameter was found to be statistically significant. In the present study the placental coefficient in normal birth weight group was  $0.158 \pm 0.014$  and in low birth weight group was  $0.188 \pm 0.031$ .

**Table 1: Number of cases**

Groups	N=100
Group A (Placentae of normal birth weight)	50
Group B (Placentae of low birth weight < 2500g)	50

**Table 2: Relation of birth weight with placental weight and volume**

Parameters		GroupA (Placentae of normal birth weight)=50		GroupB(Placentae of low birth weight < 2500g )=50		Total=100	
		No.	(%)	No.	(%)	No.	(%)
Weight of placenta (gms)	<400	0	0	30	60	30	30
	400-500	36	72	20	40	56	56
	>500	14	28	0	0	14	14
Volume of placenta(ml)	≤ 400	14	28	40	80	54	54
	401-499	23	46	7	14	30	30
	≥ 500	13	26	3	6	16	16

**Table 3: Comparison of mean of various variables**

Variable	Group A (Placentas of normal birth weight )		Group B (Placentas of low birth weight < 2500g )		p Value
	Mean	SD	Mean	SD	
Birth weight	2887.45	211.24	2011.54	368.23	<0.001**
Placental weight	465.87	31.67	392.71	60.21	<0.001**
Placental volume	439.25	40.83	376.24	46.88	<0.001**
Placental diameter	19.12	0.88	16.83	2.26	<0.001**
Placental thickness	1.79	0.27	1.71	0.27	<0.001**
Placental coefficient	0.158	0.014	0.188	0.031	<0.001**
Feto-placental ratio	6.24	0.38	5.22	0.81	<0.001**

Test applied: t-test

## Discussion

Placenta plays a key role in the development of fetus in the utero but still it receives less attention throughout the pregnancy in contrast to the foetal weight. Though many factors like race, genetic and health problems of the pregnant women determines the placental and fetal growth but still the morphometry examination of placenta will give a valuable information about the status of the foetal well being and also helpful in the management of complications in mother and the newborn. The etiology of low birth weight is multifactorial; with genetic, placental, fetal and maternal factors interplaying with each other. Despite the observed link between maternal health, placenta and newborn health, any kind of placental study is not routinely performed in hospitals. However a study focused at least on the placenta of low birth weight babies will shed light on the causative factors and will help in the better understanding of the etiology. Hence the present study is undertaken to analyze the spectrum of morphometric changes in placenta and its relation with birth weight of full term newborns. In the present study the mean placental weight was 465.87±31.67gms in normal birth weight group and 392.71±60.21 gms in

the low birth weight group and was found to be statistically significant. Placental weight and thickness has been taken as an indicator of placental function. Surya Babu et al studied 50 placentae of low birth weight babies and found that the placental parameters like weight and size of the placenta were significantly less than normal in low birth weight deliveries[7]. In a larger population size from Mexico (n: 300 live newborns) Sanin established a model to relate birth weight with placental weight[8]. Placental weight was found to be significantly related to birth weight. For each gram increase of weight of placenta, the birth weight increased by 1.98 gms (p<0.01). The placenta however was shown to have an on linear relation to birth weight and could be used as a useful noninvasive predictor of birth weight. The mean placental diameter in the present study was 19.12±0.88cm in normal birth weight group and 16.83±2.26 cm in the low birth weight group. It was found to be statistically significant. According to a study by Habib FA a "warning limit" of a placental diameter of 18 cm and placental thickness of 2 cm at 36 weeks gestation were calculated to predict low birth weight infants[9]. The mean placental thickness in the present study was 1.79±0.27cm in normal birth weight group and 1.71±0.27cm in the low birth weight group. It was found to be statistically

significant. The mean thickness of term placenta reported by Gunapriya et al., was 2.1 cm, in another study by Hatti AM it was 2.21cm whereas, in the study of Rupa L Balihallimath et al. the mean placental thickness was 2.1 cm, 5th and 95th percentiles of placental thickness varied from 1.5 to 3.0 cm, with no significant relationship with birth weight [10-12]. In the present study, the mean placental volume in the normal birth weight group was  $439.25 \pm 40.83$  ml and in the low birth weight group it was  $376.24 \pm 46.88$  ml which was statistically significant. In the study by Rupa L Balihallimath et al., the mean placental volume was  $366.08 \pm 1.10$  ml, with a significant positive correlation between the weight of the baby and the placental volume ( $r=0.662$ ;  $p<0.001$ ) [12]. This result is consistent with the other studies [13,14]. In a study by R.D. Virupaxi et al. morphometric parameters of placenta like weight and volume were significantly lower in small for gestational age group babies as compared to full term normal group babies, these values were statistically significant ( $p<0.0001$ ) [15]. Foeto-placental ratio is the ratio of foetal weight to placental weight. The normal ratio is 1:7. The mean foeto-placental ratio in normal birth weight group was 6.24 whereas in low birth weight group, it was 5.22. The difference between two groups was statistically significant ( $p<0.001$ ). Placental coefficient is defined as the ratio of placental weight to fetal weight. Normally it is 0.10 to 0.18 [16]. This correlated well with the present study. In the present study the placental coefficient in normal birth weight group was  $0.158 \pm 0.014$  and in low birth weight group was  $0.188 \pm 0.031$ . The placental coefficient falls as the placental weight increases and high placental coefficient is seen if the placental weight decreases. Placental coefficient outside the normal range is shown to be associated with perinatal adverse effects [16].

### Conclusion

We conclude that the morphometric observation of placenta is associated with foetal weight. So an early examination of not only the fetus, but also the placenta by non-invasive techniques like ultrasonography will be helpful to predict and to avoid low birth weight babies with better preventive measures. This study will also make the physicians and researcher to focus on the placenta.

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**Conflict of Interest:** Nil

**Source of support:** Nil