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# Morphology of Placenta and its Relation with Small for Date Babies in 950 Live Births

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**Abstract**

Incidence of low birth weight (LBW) and birth defects in the new born is a major health problem. This also may cause considerable financial stress to the parents and health facilities due to prolonged treatment in neonatal facility. This study was undertaken to assess morphology of placenta and its relation with LBW, babies in full term normal and small for gestational age group babies. This was a cross-sectional study of 950 placentae collected from Civil Hospital, Belgaum of which 636 were full term normal babies and 314 were of small for date babies. Variables like placental weight and volume were studied. The results of the study indicated that both study variables mentioned above were significantly smaller in placenta of small for gestational age group infants. In full term control group, significant statistical correlation was found between birth weight to placental weight and placental volume. In small for gestational group babies also significant statistical correlation between birth weight to placental weight and placental volume was found but values were lower than control groups. Examination of placenta by obstetrician and pediatrician is important to throw light into prenatal life and provide information for the future care of mother and her offspring.

**Key Words:** Placenta; Placental volume; Placental weight

## Introduction

Incidence of low birth weight (LBW) and birth defects in the newborn is a major health problem. This also may cause considerable financial stress to the parents as well as health facilities due to prolonged treatment in neonatal facility.

Intrauterine growth retardation or small for gestational age group babies is a complication of many pregnancies. The factors responsible for fetal growth retardation include maternal malnutrition, anemia, preeclampsia, eclampsia, maternal infection, drug abuse, genetic factors and genetic diseses, congenital malformations, multiple gestations, placental and cord abnormalities and maternal smoking. In many cases, specific cause is never identified. Survival and growth of fetus is essentially dependent on formation, maturation and function of the placenta.

Low birth weight is well known to be associated with disease in the neonatal and subsequent periods of early life. The risks of hypertension, coronary artery disease and diabetes mellitus are inversely related to birth weight and lower values in anthropometry of the new born [1].

The birth weight of the baby at the time of delivery will have an impact on further consequences in prenatal as well as in adult life. The first study of growth rate of normal human fetuses and their placentae, to ascertain their inter relationship through the stages of intra uterine life, was done by Hendricks [2] and subsequently by Boyd and Hamilton [3].

Since 19th century, basic understanding of the cell biology, molecular biology, biochemistry, physiology, pharmacology and immunology of the placenta has increased almost exponentially.

There are later studies to suggest that placental volume in the second trimester can predict birth weight and newborn anthropometry and identify the fetus in danger of being LBW [4].

Much research work has been done on the placental weight and feto placental weight ratios at different gestational ages. Results vary considerably depending upon the methods used in handling the placenta. Relations between birth weight, placental surface area and placental volume have been described in normal term pregnancies and pre-term pregnancies. There is little available information about placental dimensions in small for gestational age babies. During last quarter of a century, the placenta has, however, increasingly attracted the attention of workers from a wide range of scientific disciplines.

This scenario prompted this co-relative study, between placental morphology and its relation to birth weight of the baby.. This could help, to some extent, in assessing the relation between them as information on this aspect is scarce in this part of the Karnataka State. This study was aimed to assess the morphology of placenta and their relation to LBW babies.

## Materials and Methods

This correlation study was conducted from the 950 placentae expelled during normal delivery and during caesarian section at Civil Hospital, Belgaum (Attached to Jawaharlal Nehru Medical College, Belgaum.) during the period of Sept 2001 to June 2002.

Parents of the baby were informed about intended work in detail and their informed consent was obtained and also the permission was obtained from Head of the Department, Obstetrics and Gynecology, Civil Hospital, Belgaum to carry out the study.

The placenta from full term normal, cesarean deliveries and small for gestational age group babies were included in the study. Pre term deliveries, still birth and macerated babies were excluded. Detailed history of the mother such as name, age, parity, address, occupation, marital history, previous obstetric history, past history of major illness, present medical history and habits were recorded on predesigned and pretested proforma. All placentae were collected immediately after delivery and washed in tap water which removed the blood collected in membranes and clots. Morphological studies such as shape of the placenta (normal discoidal any unusual shapes like bilobed, band like, horse-shoe shaped), fetal surface of the placenta (For the insertion of umbilical cord and attachment of fetal membranes) were carried out.

The cord was cut at about five cms away from its insertion. . Any gross pathological findings on fetal surface and maternal surface of the placenta like fresh infarctions, haematomas any white plaque due to deposition of calcium were noted. With regard to baby, gestational age and birth weight and apgar score were observed from the record, Gestational age of the mother was calculated from the first day of the last menstrual period which was known in every case. Term babies were considered normal when their birth weights fell between 19$^{th}$ percentiles for their gestational age. Pregnancies and deliveries of the term babies were normal. The criteria for small for gestational age babies considered as whose birth weights were below the 10$^{th}$ percentile for their gestational ages.

## Results

Out of 950 placentae collected and examined, 636 were from full term normal babies with 38 to 42 weeks of gestation and birth weight more than 2500 gms. There were 314 of small for gestational age group babies with 38 to 42 weeks of gestation with birth weight less than 2500 gms. In both full term normal babies and small for gestational age babies the age of the mother was between 18 to 32 years. Gestational age of the mother was between 38 to 42 weeks.

*Full Term Normal babies (n=636)*

Of the 636 placentae incidence of primie gravida females was more (57.24%) as compared to multi gravida females (42.76%). Twelve mothers had undergone caesarian section and the indication was fetal distress, cephalopelvic disproportion, breech presentation, three had pre-eclampic toxemia. Sixty eight mothers had iron deficiency anemia (Hb% = 8 to 10 gm%). The incidence of iron deficiency anemia was 10.69% in this group.

Further the placentae were divided into two categories that is placenta of babies weighing between 2500 to 3000 gms (411) and baby weighing more than 3000 gms (225). Incidence of various parameter of placentae was noted down.

All the morphometric parameters of the placentae viz. placental weight and volume were measured and compared with small for gestational age group babies. The volume of the placenta was measured by immersing the placenta in water and the water expelled is measured and that corresponds to the weight of the placenta. The mean values of these parameters showed more as compared to small for gestational age group babies (Table No. 1).

Table 1. Mean Birth Weight and Placental Measurements with Standard Deviation and Test of Significance in Two Groups

| Parameters | Full Term Normal Group (n=636) | | Small for date group babies. (n=314) | | | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Z | P |
| Birth weight (gms) | 2961 | 299.8 | 2188 | 187 | 45.00 | <.0001 |
| Placental weight (gms) | 488.1 | 10.9 | 400 | 6.40 | 118.6 | <.0001 |
| Placental Volume (ml) | 488.1 | 10.9 | 400 | 6.40 | 118.6 | <.0001 |

Table 2. Co-Relation Co-Efficient and Test of Significance between Full Term Normal Babies and Full Term IUGR Babies

| Parameters | Full Term Normal Group (n=636) | | | | Full Term IUGR Group (n=314) | | | |
|---|---|---|---|---|---|---|---|---|
| | y | t | DE | p | y | t | DE | p |
| Birth and placental weight | 0.103 | 2.789 | 634 | < 0.01 | 0.230 | 6.821 | 312 | < 0.001 |
| Birth weight and placental volume | 0.103 | 2.789 | 634 | <0.01 | 0.230 | 5.821 | 312 | <0.001 |

Table 3. Co-Relation Co-Efficient and Test of Significance between Full Term Normal Babies and Full Term IUGR Babies

| Parameters | Full Term Normal Group (n=636) | | | | Full Term IUGR Group (n=314) | | | |
|---|---|---|---|---|---|---|---|---|
| | γ | t | DE | p | γ | t | DE | p |
| Birth and placental weight | 0.103 | 2.789 | 634 | < 0.01 | 0.230 | 6.821 | 312 | < 0.001 |
| Birth weight and placental volume | 0.103 | 2.789 | 634 | <0.01 | 0.230 | 5.821 | 312 | <0.001 |

*Small for gestational age group babies (n=314)*

The babies were grouped into two categories. One group having baby's weight between 2000-2500 gms (271) and second group having the birth weight below 2000 gms (43). Nine mothers had undergone cesarean section. The indication for three among them were fetal distress, two mothers had pre eclamptic toxemia, one mother had breech presentation and three had cephalo pelvic disproportion. Forty two mothers had iron deficiency anemia. Incidence of anemia was more in this group (13.37%).

In this group the incidence of primi gravida females were more (52.22%). This group was found more between the age group of 18-21 years. The number of multi gravida females were (47.7%). Incidence of small for gestational agewas more in primi gravida females as compared to multi gravida females. Incidence was more between the age group of 18-21 years.

In this group 207 placentae had normal discoidal shape (65%). Significantly less 107 (34%) placentae had irregular shape of the placenta was taken on the paper keeping the placenta on it and by using thread. The fetal membranes were normal and no pathological findings were seen on fetal surface. No calcification was seen on the fetal surface of the placenta (Table 2).

Fresh infarctions were seen in two placentae on this surface (0.62%). Among them one mother had pre eclamptic toxemia and delivered twin babies. Calcification was found in eleven placentae (3.50%). This showed that infarction and calcification were more in small for gestational age group babies as compared to control groups.

The morphometric analysis of the placenta showed following results in this group. All the morphometric parameters of the placenta viz. placental weight, placental volume, of the placenta were measured and compared with control groups. It was found out that all parameters were less in small for gestational age group as compared to control groups. On applying test of significance these values were found to be significant (Table 1 and 2). The co-relation co-efficient between birth weight of the baby with placental parameters was calculated and following results were obtained (Table 3).

In this study among 950 live births 636 were of full term normal babies and 314 were of small for gestational agr group babies. The incidence ofsmall for gestational age group babies were (33%).

**Discussion**

Intra uterine growth retardation is a complication of many pregnancies. The factors responsible for fetal growth retardation include maternal malnutrition, anemia, pre-eclampsia, eclampsia, maternal infection, drug abuse, genetic factors, genetic diseases, congenital malformations multiple gestations, placental/cord abnormalities and maternal smoking. The miscellaneous causes like short interpregnancy intervals, race, maternal age and low socioeconomic status also contribute in small for gestational age in babies. In many cases specific cause is never identified. Growth and survival of the fetus is essentially dependent on development, formation, maturation and function of the placenta. Hence study of the morphology of the placenta is very important and useful in learning its relation and its predictive value to fetal weight and possible birth defects.

Earlier workers attended to the morphology and morphometry of placenta in relation to babies weight in term and preterm deliveries. It is well known that in normal preterm and term infants there is a direct relation between birth weight and weight of the placenta. Relations between birth weight and placental area and placental volume have also been described [5].

Small for gestational age babies have smaller than normal placentae for their gestational ages. There is little available information about other placental dimensions in this type of babies. A few workers attempted to find out the correlation between placental parameters with full term IUGR babies [6]. Observations and results of the present study show some findings which are similar to those of earlier workers [5]. However there are a few differences as well.

The placental parameters like weight, volume, were measured by Younozai et al. [5] in normal term, preterm and small for gestational age group babies. They found out that the weight of the placenta of the small for gestational age group babies were significantly less than in the pre term and term infants ($p<0.01$). All the above parameters were significantly smaller in small for gestational age group babies as compared to those in the normal preterm and term infants in this study also.

In our study morphometric parameters of placenta like, weight, volume were significantly lower in small for gestational age group babies as compared to full term normal group babies, these values were statistically significant ($p<0.0001$). This study had similarities to the study conducted by Younozai et al. [5].

In full term normal group and small for gestational age group babies babies there was significant statistical correlation between birth weight and placental weight and, birth weight and placental volume. In another study of small for gestational age group babies placentae findings were compared with normal group placentae. Authors found out that all morphometric data like placental weight, diameter, thickness, circumference were less in small for gestational age group babies than that of normal group [7]. In this study incidence of IUGR was more in primies between age group of 15-25. After 25 to 35 years incidence of IUGR was more in multigravidae. In this study all the parameters of the placenta resembles the study conducted by Seth et al. [7] with few differences that is in this study number of primies was more in IUGR babies

(52.22%) than multies (47.7%). In full term normal group primies were 56.76% whereas multies were 43.23%.

A study conducted on ultra sonographic volume of the placenta found that, placental volume was directly proportional to the birth weight of the babies. They concluded that measurement of the placental volume may help in determination of baby's growth. There was significant co-relation was found between birth weight and placental volume ($p<0.01$) [8]. In this study, placental volume was measured by immersing the placenta in water. The volume of the placenta was less in small for gestational age group babies as compared to full term normal group babies ($p<0.0001$).

Examination of maternal surface of the placenta in both full term normal group and small for gestational age group babies was carried out by Bjro [9] and Leaurinie [10]. They found out that infarction was more in small for gestational age group babies as compared to normal group. In our study incidence of fresh infarction was found on the maternal surface of the placenta in (1.6%) in small for gestational age group babies. The patient had pre eclamptic toxemia and delivered twin Babies.

Low birth weight is associated with disease in the neonatal and subsequent periods of early life. The risk of hypertension, coronary artery disease and diabetes mellitus are related inversely to birth weight and new born anthropometry. These relations operate within the normal range of birth weight. Therefore the size and the shape of the neonate might be more relevant to health throughout the life cycle than presently thought.

Ultrasonography revolutionized the assessment of fetal growth. Goldberg et al., [11] took serial measurements during pregnancy and showed that birth size was only predicted by fetal measurements made in the third trimester. Clappe et al [12] reported an association between second trimester placental volume and birth weight. The predictive value of second trimester placental volume on birth weight was shown by Wolf et al [13]. He concluded that poor placental growth preceded fetal growth retardation.

From above study it is clear that if measurement of early placental volume improves the ability to predict birth size, it may be helpful in earlier identification of the fetus at risk and thus facilitate preparation for management at least in neonatal and childhood period. In this study incidence of small for gestational age group babies was 33%. The results of this study indicate that further studies of the placenta and placental and/or fetal relations especially if combined with histologic examination, may provide a better understanding of abnormalities of fetal growth.

**Conclusion**

As anticipated, values of placental weight, volume were lower in small for gestational age group babies as compared to full term normal group babies. The volume of the placenta is directly proportional to the birth weight of the baby. Measurement of the placental volume can be done by the non-invasive technique like ultrasonography (USG) and this will be helpful in assessing the development of the baby.

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