

*Original Research Article***Placental Pathology in Low Birth Weight Deliveries: A Clinico-Pathological Study****Kolakkadan Hasaf M.<sup>1</sup>, Monnappa Gitanjali M.<sup>2</sup>, Sudha H.M.<sup>3</sup>, Monnappa Priyadarshini M.<sup>4</sup>, Tasha Kader<sup>5</sup>, Sunitha V.P.<sup>6</sup>**

<sup>1,2</sup>Assistant Professor <sup>3</sup>M.B.BS Intern, Department of Pathology, DM Wayanad Institute of Medical Sciences, Meppadi Post, Wayanad, Kerala, 673577, India. <sup>3</sup>Senior Professor, Department of Pathology, M.S Ramaiah Medical College, Bengaluru, Karnataka 560054, India. <sup>4</sup>Assistant Professor, Department of Pathology, Kodagu Institute of Medical Sciences, Madikeri, Karnataka 571201, India. <sup>6</sup>Pathologist, K.C General Hospital, Bengaluru, Karnataka 560003, India.

**Abstract**

*Background and Objectives:* Placenta plays a central role in fetal development and well-being. The intimate connection between the fetus and placenta has been recognized throughout history. This study was conducted to evaluate the spectrum of placental pathology associated with low birth weight deliveries (LBW) and to assess various associated etiological factors.

**Corresponding Author:**

**Dr. Gitanjali Monnappa M,**  
Assistant Professor, Department of Pathology, DM Wayanad Institute of Medical Sciences, Meppadi Post, Wayanad, Kerala, 673577, India.  
E-mail: [geet.mm@gmail.com](mailto:geet.mm@gmail.com)

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*Materials and methods:* A total of 106 placentae from LBW deliveries were analyzed in this study for gross and microscopic abnormalities. Clinical data of these cases were also collected and correlated.

*Results:* The prevalence of placental pathology was found to be 85.2% in LBW deliveries, the most common pathologies being infarction, intervillous hemorrhage, calcification and retroplacental hematoma. The most common clinical conditions associated with LBW were preterm delivery (67%), preeclampsia (30.2%), IUGR (29.2%), and abruptio placenta (9.4%).

*Interpretation & Conclusion:* Our study shows that LBW deliveries are associated with significant placental pathology. Thus we conclude that examination of placenta in these cases are indispensable and has to be carried out as a routine protocol.

**Keywords:** Histopathology; Low Birth Weight; Placenta.

**Introduction**

Placenta is the most accurate record of the infant's prenatal experience. It is a unique organ that arises *denovo*, and is directly related to growth and development of the fetus. The placenta (Greek, *plakuos* = flat cake) is named on the basis of the gross anatomical appearance [1].

The placenta now is understood to be the first fetal organ that becomes functional during pregnancy, an organ that plays an essential role in both fetal development and maternal health.

The primary functions of the placenta are to provide an immunological barrier between fetus and mother, mediate the transfer of respiratory gases, water, ions and nutrients, and produce and secrete a vast array of hormones, cytokines and signaling molecules [2].

Improper function of this critical organ causes fetal abnormalities, preterm labor, preeclampsia and IUGR [3]. Despite observed link between placenta and newborn health, pathological examination of placenta is seldom performed in institutions and thus the etiology for low birth weight in such infants are not well defined.

As there is a clear relationship between placental pathology and fetal growth restriction, a thorough study of placenta is indispensable to evaluate possible etiological factors.

The present study is conducted to evaluate the spectrum of placental morphology associated with LBW infants.

## Materials And Methods

This prospective study on placentae of low birth weight infants, i.e. less than 2500 grams was undertaken in Department of Pathology, M.S Ramaiah Medical College and Teaching Hospital, Bangalore during Aug 2011 to May 2013. Detailed history was taken from patient's records and MRD, parturition register and Pediatrician's newborn assessment sheet.

106 Placentae belonging to LBW category were obtained from Department of Obstetrics and Gynecology, M.S Ramaiah Medical Teaching Hospital. Cases of intrauterine death and multiple pregnancies were excluded from the study.

Collected placentae were drained completely of blood, weighed and washed before formalin fixation. The shape of the placenta was assessed. The extra placental membranes was inspected for adherent blood clot, color, transparency and exudate if any. The length of umbilical cord was measured and examined for the number of vessels, true knots, false knots and insertion (central, peripheral or velamentous). The membranes were trimmed and the cord was cut at about 4cms from its insertion. The weight of the placenta was measured on a standard weighing scale. Placental diameter was measured using a thread and the thickness of placenta was measured at the center of placenta after giving serial cuts.

The maternal surface of the placenta was inspected for completeness, adhered blood clots, calcification and infarction. The fetal surface was examined for colour and transparency, insertion of umbilical cord and attachment of fetal membranes.

Following this, placental parenchyma was cut into thin incomplete strips at 0.5 cm interval (bread loaf manner) to aid fixation. It was left for fixation in 10% formaldehyde for 24-48 hours.

**Table 1:** Distribution of cases based on birth weight

Category	Number of cases	Percentage
LBW	70	66%
VLBW	31	29.3%
ELBW	05	4.7%
Total	106	100%

Microscopic studies were performed on tissue samples taken from each placenta, including at least 6 blocks of placental tissue, viz: 1) a transverse section of umbilical cord; 2) a free membrane bit for membrane role; 3) two tissue bits of parenchyma including villi and intervillous space from edge of the placenta; 4) Two sections of parenchyma from placental center; 5) one to two sections from abnormal gross pathology. All of these samples were stained with haematoxylin and eosin. Microscopic abnormalities were noted.

## Statistical Analysis

Chi square test was used to find the association between the placental pathology and clinical diagnosis, p value < 0.05 was considered as statistically significant. Data was analyzed using SPSS version 17.

## Results

All the cases were subcategorized into three as per WHO classification: low birth weight (LBW, 2500- 1501 grams), very low birth weight (VLBW, 1500-1001 grams), extremely low birth weight (ELBW, <1000 grams).

The age of the mothers ranged from 18 to 36 years with a mean of 26.08 years. The mean period of gestation was found to be 34.5 weeks. It was found that 49 cases were primigravida and 57 cases were multigravida.

Clinical diagnosis of all the cases is depicted in table 2. These clinical diagnoses were present singly or in combination with each other. However 67% of the cases belonged to the preterm category indicating that this is the most common cause for low birth weight in our country.

Preeclampsia and Intrauterine growth retardation (IUGR) were seen in nearly 30% of cases. There were 15 cases with no clinical abnormality.



**Fig. 1:** Placental cut surface showing a large wedge shaped focus of infarction with adjacent areas of hemorrhage

**Table 2:** Clinical diagnosis and their distribution

Clinical diagnosis	Frequency	Percentage (%)
Preeclampsia	32	30.2
IUGR	31	29.2
Preterm	71	67
Abruption	10	9.4
PROM	17	16
Anemia	20	18.9
Hypothyroidism	6	5.7
Cardiac diseases	4	3.7
Normal pregnancy	15	14.2

**Table 3:** Microscopic findings

Parameter	Frequency	Percentage (%)
Infarction	85	80.2
Calcification	64	60.4
Intervillous hemorrhage	75	70.8
Villitis	5	4.7
Chorioamnionitis	31	29.2
Single umbilical artery	3	2.8

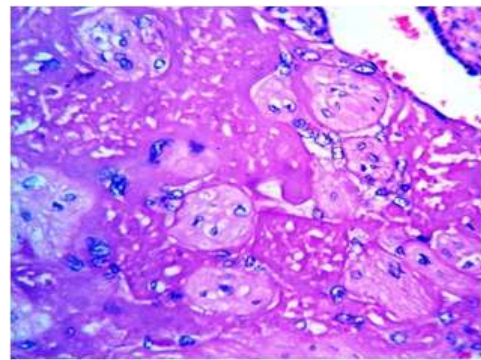


**Fig. 2:** Parenchymal hemorrhage in a case of abruptio placentae.

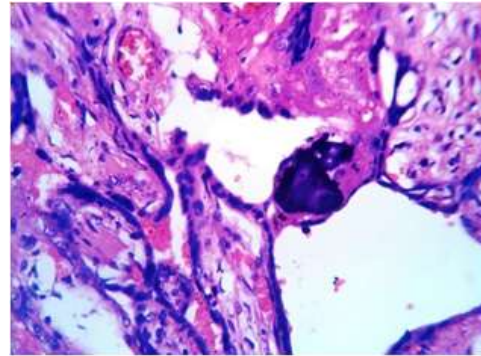
Out of 106 placentae examined 96 placentae showed microscopic abnormalities. Infarction was found to be the most common pathology seen in placentae of low birth weight deliveries with an incidence of 80.2%. Intervillous hemorrhage and calcification was also found in a substantial number of cases with an incidence of 70% and 60% respectively.

A significant correlation was found between:

1. Preterm cases and incidence of infarction with a p value <0.05;
2. Preeclampsia and abruption cases showed the maximum incidence of calcification with a significant p value (<0.05);
3. Intervillous hemorrhage and preterm cases (p value <0.05);
4. Chorioamnionitis was found in 29.2% (n=31) of cases with highest incidence among abruption and PROM cases with statistical significance (p value <0.05);



**Fig.3:** Infarction of the chorionic villi (H & E, x400)



**Fig. 4:** Photomicrograph showing focus of calcification (H & E, x400)

5. Villitis and preeclampsia / eclampsia with a statistically significant correlation (p value <0.05).

## Discussion

The placenta is a dynamic organ which plays a key role in maintaining fetal and maternal wellbeing. Fetal growth restriction and placental pathology go hand in hand. In the present study we evaluated 106 placentae from low birth weight deliveries to evaluate the histomorphological changes and to enumerate possible etiologies.

A study conducted by Wessel et al. estimated that annually 24 million LBW infants are born in developing countries. The incidence of LBW delivery is around 5% in industrialized nations, whereas it varies from 5 to 30% in under developed or developing nations [4].

In the present study majority of the cases belonged to LBW category (66%) followed by 29.3% cases of VLBW and 4.7% cases of ELBW. Similar findings were reported by Shin SM et al. [5]. and Akin Y et al [6]. in their respective studies.

Out of 106 cases, 30% (n=32) had preeclampsia with or without other clinical conditions. 67% of the cases belonged to preterm category indicating that prematurity is the leading cause for IUGR

and perinatal mortality in India. However all the conditions listed in Table 2 can ultimately lead to preterm delivery or IUGR.

Low birth weight infants often had more than one type of pathology. Out of a total 106 cases studied, 90.5% (n=96) of placentae showed microscopic abnormalities. Rayburn et al. [7] found 92% abnormal histologies of placentae in 151 'small for gestational age' infants.

Infarction was seen in 85 out of 106 placentae studied with an incidence of 80.2%. The incidence of infarction was found to be 85% in preterm deliveries with statistically significant p value (<0.05). Das B et al. [8] reported a 70% incidence of infarction in eclampsia cases in their study.

Calcification was found in 60.4% of cases in the current study. Preeclampsia and abruption cases were the major contributors with an incidence of 84.4% and 90% respectively. Calcification is part of normal ageing and maturation process of placenta. But when it occurs prematurely it indicates pathological maturation of placenta and is associated with intrauterine growth retardation and premature placental separation (abruption) [9].

In our study the incidence of chorioamnionitis among low birth weight deliveries was found to be 29.2% (n=31).Chellam et al. [10] examined placentae associated with LBW infants and found chorioamnionitis and funiscitis in 48.5% specimens. Similar findings were reported by Castro MM et al. [11].

### Conclusion

The prevalence of placental pathology in low birth weight infants is rather high and the examination of placenta provides considerable amount of data in such cases. The placental pathologies are not single but rather multiple in low birth weight deliveries. Preterm delivery was found to be the most common etiology for low birth weight in our study. The etiologies are not single but tends to be multiple in the mothers of these babies.

Placental pathology plays a stem role in the growth retardation along with other maternal complications. Thus we conclude that examination of placenta in these cases are indispensable and has to be carried out as a routine protocol.

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