Original Research Article

Study of Histomorphological Features of Placenta After Delivery in Low Birth Weight as Well as Normal Infants

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Abstract

Background: Placenta is the most potent endocrine organ in the body. The human placenta is of a hemochorial -villous type. The ratio of placental weight to birth weight has been described as a marker of fetal growth and was found to be associated with altered fibrinogen and raised blood pressure in adult life. **Observations**: This study was done to identify histomorphological features of placenta and correlation with the perinatal outcome after delivery in low birth weight (LBW) as well as normal birth weight (NBW) infants. **Methods**: Placenta of delivered patients in labor room of a tertiary care centre was studied. An estimated 46 placentae of LBW newborn as cases and normal weight newborn as Controls were taken for study. Factors like fetal surface or color, amnion and chorionic vessels; Maternal surface for cotyledons, presence of tears, hematoma and calcifications were examined. We have also evaluated for measurements like diameter and weight of placenta. Insertion of membranes, site of rupture, decidual necrosis, and edema was noted. Histo-morphological results were tabulated and analyzed. **Results**: study results shows that in comparative statistics of numerical variables between LBW and NBW group all the above tabulated numerical variables i.e. gestational age, USG GA, Apgar, birth weight , placental weight, FP ratio, placental diameter and cotyledons are statistically highly significant different(p 0.000).**Conclusion**: Placental pathological examination will more accurately reveal the causes of low birth weight infants and also, apart from retrospective diagnosis, may help predict problems which may be repeatedly encountered in future pregnancies.

Keywords: Histomorphology, LBW (Low Birth Weight), Perinatal outcomes, Placenta, NBW (Normal birth weight).

Introduction

Placenta is the most accurate record of the infants, prenatal experience[1]. Transfer of oxygen and metabolites between the maternal and fetal blood is a critical feature of its function. Unlike any other organ in the human body, the placenta has a life span of only about nine months; but despite its very less period of functioning, quantitatively it is the most potent endocrine organ in the body[2]. The human placenta is of a hemochorial -villous type i.e., basically it consists of three layers of tissue interposed between the fetal and maternal blood and the villous feature comprises of trophoblastic erosion of maternal vessels with formation of large sinusoids and trabeculae across the blood filled spaces[2].The ratio of placental weight to birth weight has been described as a marker of fetal growth and was found to be associated with altered fibrinogen and raised blood pressure in adult life.[3] Sir Barker and colleagues, study suggested an association between a raised ratio of placental weight to birth weight and a decreased ratio of head circumference to fetal birth length, and it was therefore inferred that the increased ratio of placental weight to birth weight may be a marker of intra uterine growth restriction[3]We have conducted this study to identify histo-morphological features of placenta after delivery in Low Birth Weight as well as Normal infants. We have also compared correlation of histo-morphology of the placenta with perinatal outcomes in both group infants.

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Material and Methods

This comparative Study was performed on the female patients admitted in the labor room of Department Of Obstetrics And Gynecology, Sri Krishna Medical College, Muzaffarpur, Bihar. All the subjects studied were residing of nearby rural region. Ethical clearance was taken from institutional ethical board.

Patients included were having following criteria

- Singleton, live pregnancy.
- Placentae of infants weighing between 500 and 2499 grams delivered between 1st May 2017 to 30th April 2018 were included as cases.
- Placentae of infants weighing 2500gms during same time period and more for control.

Patients with multiple pregnancies and history of Intra Uterine Fetal Death were excluded from the study.

SAMPLE SIZE - An estimated 46 placentae of LBW babies as cases were studied. - Control- 46 placentae of normal weight babies as Controls were taken. All the placenta ere fixed in 10% formalin immediately after expulsion and the samples were brought to the Department of Pathology.

Following features were evaluated

- Fetal surface or color, amnion and chorionic vessels.

- Maternal surface for cotyledons, presence of tears, hematoma and calcifications.
- We have also evaluated for measurements like diameter and weight of placenta.
- Insertion of membranes, site of rupture, decidual necrosis, and edema was noted.

All above features were studied and recorded for both low birth weight and normal weight controls. All the data was tabulated and evaluated in ANOVA [SPSS version 21].

Results

All the findings were tabulated and evaluated.

Table 1, shows that in comparative statistics of numerical variables between LBW and NBW group all the above tabulated numerical variables i.e. gestational age, USG GA, Apgar, birth weight , placental weight, FP ratio, placental diameter and cotyledons are statistically highly significant different(p 0.000).

Table 1: Comparison of numerical variables between Groups LBW and NBW – Mann-Whitney U test

	Rank Sum LBW	Rank Sum NBW	U	Z	p-level	Valid N LBW	Valid N NBW
Gestational Age	1636.500	2641.500	555.5000	-3.924	0.000	46	46
GA_USG	1083.000	3195.000	2.0000	-8.246	0.000	46	46
Apgar	1490.500	2787.500	409.5000	-5.064	0.000	46	46
Birth Weight	1081.000	3197.000	0.0000	-8.262	0.000	46	46
Placental Weight	1111.000	3167.000	30.0000	-8.028	0.000	46	46
FP_Ratio	1669.500	2608.500	588.5000	-3.666	0.000	46	46
Placental Diameter	1107.500	3170.500	26.5000	-8.055	0.000	46	46
Cotyledons	1312.000	2966.000	231.0000	-6.458	0.000	46	46

Table 2: Comparison of attachment of umbilical cord in placenta in study groups

	Cord Attachment		Totals
	Central	Eccentric	
LBW	35	11	46
Row%	76.09	23.91	
NBW	40	6	46
Row%	86.96	13.04	
Totals	75	17	92

This table shows 23.91% of placenta in LBW group had eccentric cord attachment compared to 13.04% in NBW group. This is statistically not significant

Table 3:Infarction

	Infarction		Totals
	No	Yes	
LBW	28	18	46
Row%	60.87	39.13	
NBW	44	2	46
Row%	95.65	4.35	
Totals	75	17	92

This table shows that infarction was present in 39.13 % cases in LBW group in HPE compared to 4.35% in NBW group. This is statistically highly significant ($p < 0.001$)

Table 4:Fibrin

	Fibrin		Totals
	No	Yes	
LBW	24	22	46
Row%	52.17	47.83	
NBW	31	15	46
Row%	67.39	32.61	
Totals	55	37	92

This table shows that fibrin deposition was found in 47.83% of placenta compared to 32.61% in NBW group. This is statistically not significant.

Table 5:Calcification

	Calcification		Totals
	Yes	No	
LBW	20	26	46
Row%	43.48	56.52	
NBW	8	38	46
Row%	17.39	82.61	
Totals	28	64	92

This table shows that calcification was found in 43.48% of placenta of LBW group in HPE compared to 17.39% in NBW group . This is statistically significant (p 0.012).

Table 6:Haemorrhage

	Haemorrhage		Totals
	Yes	No	
LBW	19	27	46
Row%	41.30	58.70	
NBW	7	39	46
Row%	15.22	84.78	
Totals	26	66	92

This table shows in HPE haemorrhage was found in 41.30% in LBW compared to 15,22 % in NBW group.This is statistically highly significant (p0.010)

Table 7:Fibrosis

	Fibrosis		Totals
	Yes	No	
LBW	17	29	46
Row%	36.96	63.04	
NBW	2	44	46
Row%	4.35	95.65	
Totals	19	73	92

This table shows that in HPE fibrosis was found in 36.96% cases in LBW group compared to 4.35 % in NBW group. This is statistically highly significant (p< 0.001).

Table 8: Villous vascularity

	Villous vascularity			Totals
	Normal	hypovascular	Hypervascular	
LBW	27	10	9	46
Row%	58.70	21.74	19.57	
NBW	46	0	0	46
Row%	100.0	0.0	0.0	
Totals	73	10	9	92

This table shows that in HPE abnormal villous vascularity was found in 41.31% cases in LBW group compared to 0.00 % in NBW group. This is statistically highly significant (p< 0.001)

Table 9:Cord Abnormality (Single umbilical artery)

	Cord Abnormality		Totals
	Single UA	No	
LBW	1	45	46
Row%	2.17	97.83	
NBW	1	45	46
Row%	2.17	97.83	
Totals	2	90	92

This table shows that single umbilical artery was found in 2.17% cases in LBW group as well as in NBW group. This is statistically not significant (p 1.000).

Table 10:Cytotrophoblast proliferation

	Cytotrophoblast proliferation		Total
	Yes	No	
LBW	16	30	46
Row%	34.78	65.22	
NBW	1	45	46
Row%	2.17	97.83	
Totals	17	75	92

This table shows that in HPE cytotrophoblast proliferation was found in 34.78% cases in LBW group compared to 2.17% in NBW group. This is statistically highly significant (p < 0.001).

Discussion

In our study we found that mean placental weight, FP ratio, placental diameter and number of cotyledons were significantly lower in LBW group Placental weight and size were directly proportional to the birth weight of babies. A study done by Redmann et al also reported similar findings[4].Separate studies conducted by Bandana Das et al, Khar et al ans Lao et al also reported decrease FP ratio in LBW babies[5-8]Heinonenet al reported a decrease in FP ratio in severe IUGR cases.Study by Mallik GB et al also reported decrease in size and weight of placenta in IUGR babies[9]Low birth weight infants often have more than one type of placental pathology. In our study 46 placentas had 144 pathologies with multifactorial causes. Pilaiwan also found in their study that 92 placenta had172 pathologies[10]. Of interest is the fact that we found variation in cord attachment and cord abnormality e.g. single umbilical artery to be comparable in both groups.Again, we found in our study that infarction was present

in 39.13 % cases in LBW group in HPE compared to 4.35% in NBW group which was highly significant. The presence of infarction in HPE indicates a 14.14 times increased risk of having LBW baby. Calcification of placenta was also present in statistically significant proportions (43.48%) of LBW group compared to17.39% of NBW group.Haemorrhage was found in 41.30% cases in LBW group compared to 15.22% in NBW group which was also significant. In fact presence of haemorrhage increases risk of having LBW baby3.92 times. Significantly Fibrosis was found in 36.96% cases in LBW group compared to 4.35 % in NBW group and its presence increases risk of LBW 12.90 times.In our study abnormal villous vascularity was found in 41.31% cases in LBW group compared to none in NBW group which predicted 65.95 times increased risk of having LBW baby. Cytotrophoblast proliferation was found in 34.78% cases in LBW group compared to 2.17% in NBW group which was also statistically highly significant and predicted 24.0 times increased risk of having LBW baby. Earlier studies by Nag and Chakraborty et al (2013)have shown that a significant increase in cytotrophoblast proliferation in the placental villi may also indicate a disturbance in the hormonal factors which may probably lead to altered morphometry of placenta resulting in PIH in the mother and low birth weight babies[11]. In our study we found that although fibrin deposition was found in 47.83% and inflammation in 23.91% of placenta this was statistically not significant.

Conclusion

Perinatal outcome is the reflection of placental function. Placental abnormality may be responsible for many fetal problems including low birth weight. In the present study prevalence of placental pathology among low birth weight infants was rather high compared to normal birth weight infants.Placental pathological examination will more accurately reveal the causes of low birth weight infants and also, apart from retrospective diagnosis, may help predict problems which may be repeatedly encountered in future pregnancies.

Conflict of Interest: Nil
Source of support:Nil

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