DOI: 10.14260/jemds/2015/107

ORIGINAL ARTICLE

MORPHOMETRIC STUDY OF PLACENTA OF FULL TERM NEW BORN & ITS RELATION TO FETAL WEIGHT: A STUDY IN TERTIARY CARE HOSPITAL OF ODISHA

Susmita Senapati[1], Lopamudra Nayak[2], Shashi Shankar Behera[3], Prafulla Kumar Chinara[4]

HOW TO CITE THIS ARTICLE:
Susmita Senapati, Lopamudra Nayak, Shashi Shankar Behera, Prafulla Kumar Chinara. "Morphometric Study of Placenta of Full Term New Born & its Relation to Fetal Weight: A Study in Tertiary Care Hospital of Odisha". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 05, January 15; Page: 742-747, DOI:10.14260/jemds/2015/107

ABSTRACT: Placenta is a vital organ for maintaining pregnancy and promoting normal fetal development and function. It is the only organ in the body which is derived from two separate individuals, the mother and the fetus. It is responsible for their spiratory, nutritional, excretory, endocrine and the immunological functions of the fetus. Birth weight is an important determinant of child survival, healthy growth and Development. In Obstetrics, the relationship of birth weight and perinatal outcome has been long appreciated. As we know, low birth weight is a well-established risk factor adverse long term health of the child. With this knowledge, a study was conducted in the Obstetrics & Gynaecology department of IMS& SUM Hospital and KIMS Hospital, Bhubaneswar. Placentae from 103 uncomplicated pregnant patients admitted to the indoor department of the hospital were collected. Morphometric examination of all the parameters including placental weight, fetal and maternal surface area, and number of cotyledons and site of umbilical cord insertion were measured in normal and low birth weight babies. It was seen that placental parameters of low birth weight babies were comparatively lower than that of normal babies. Increase in placental size is significantly associated with maternal weight, & it is an independent predictor of birth weight. Large placental size & predicting high blood pressure in adulthood (Hind march PC fetal 2000).[1] It has been shown that maternal diseases influence fetal & placental weight Barker et al (1991).[2] The placental weight has a significant role in fetal growth in terms of weight, body length & cord length but it has no significant role in presence of meconium – stained fluid (LoYF, et.al 2002).[3]

KEYWORDS: Placenta, birth weight, low birth weight, cotyledons, surface area.

INTRODUCTION: The placenta is an organ, that connects the developing fetus to the uterine wall, to allow nutrient uptake, waste elimination and gaseous exchange via mother's blood supply. It also fights against internal infection and produces hormones to support pregnancy. Placental expulsion begins as physiological separation from the wall of the uterus. The period from just after the child is born until just after the placenta is expelled is called the 3rd stage of labour. The placenta is usually expelled within 15-30 minutes of birth. The habit is to cut the cord immediately after birth but there is no medical reason to do that on the contrary, it is the orized that not cutting the cord helps the baby in its adaptation to extra-uterine life especially in preterm infants. In Obstetrics the relationship of birth weight and the perinatal outcome has long been appreciated, however an often neglected parameter is the morphology of the placenta, an organ which plays a key role in fetal growth. Growth and survival of the fetus is essentially depends on development, formation and maturation of the placenta. Low birth weight isa major health problem in developing countries like India. As per the national family health survey 2005, the prevalence of LBW babies is 22.2% in India. WHO estimates

DOI: 10.14260/jemds/2015/107

that globally about 25 million low birth weight babies are born each year &constitute about 28%of all live births in India (Park K 2009).[4]Evidence from large British cohort studies suggests that the combination of a large placenta & low birth weight is a strong independent risk factor for cardiovascular disease in adulthood. (Barker DJP, Osmond C Simmonds SJ 1990, 1989, 1993).[5]

Hypertension is significantly more common in cases where history includes a placenta disproportionately large for their birth weight that is, those who had a high placental weight to birth weight ratio (Barker DJP fetal).[6] The ratio between placenta & new born weight has been reported 1:6 (Cunningham FG et al 2005).[7] This measurement varies widely & differs in different countries with different placental proportions (Thomas AM et al 1925).[8] High placental weight was associated with poor perinatal outcome, a low APGAR score respiratory distress & perinatal death where as a low placental weight was associated with medical complications in the mother (Naeye FL et al 1925).[9] Placenta weight & its relationship to infant size at birth have been studied for more than a century (Adair FL et al 1925).[10] Many studies have been done on placental weight in relation to birth weight of newborn & feto-placental ratio. Hence the present cross sectional study was undertaken to evaluate the relationship of placental morphometry (Weight, surface area, number of cotyledons, umbilical insertion) in different birth weight groups.

MATERIALS & METHODS: A total of 103 freshly delivered placentae were collected from the Department of Obstetrics & Gynaecology of IMS & SUM Hospital, Bhubaneswar from August 2012 to September 2013.The placentae were studied was in the Dept. of Anatomy of the same institute. The study was approved by the Institutional Ethical Clearance Committee & Head of Obstetrics & Gynaecology Department. The age range of these pregnant mothers varied from 22yrs to 39 yrs& they belonged to middleclass families. The placentae were collected soon after their expulsion both from consecutive singleton normal and caesarean sections in between the gestational period of 32 wks to 40 wks. All the data about the mother & placenta were recorded in a standard pre-designed & pre-tested proforma.

1. Soon after delivery the weight of the new born infants were recorded by using digital weighing scale.
2. Freshly collected placenta which were thoroughly rinsed with running tap water to remove the blood clots were collected. Amniotic membrane was carefully removed from the surface of the placenta. Thereafter the weight of placenta was measured in digital weighing scale.
3. The weight of placenta & new born infants mentioned ingrams, diameter of placenta in centimeters, fetal & maternal surfaces in sq.cm. No of cotyledons and site of umbilical cord insertion (either central or peripheral) were recorded.
4. The surface area of fetal & maternal area was calculated using the formula (Batiste KR et al 2008).

   Surface area=π ×dl×ds/4

   (dl=largest diameter, ds= smallest diameter, π= 22/7)

All the placentae were after then trimmed & stored in 10%formalin in a container. The specimens were tagged with number discs before the commencement of the study for the purpose of identity. In this study the exclusion criteria were as follows - Multiple pregnancies, intrauterine growth retardation (IUGR), Mothers having history of pre-gestational hypertension, diabetes

DOI: 10.14260/jemds/2015/107

mellitus, babies with congenital abnormalities, coronary artery diseases, anemia, other vascular diseases etc.

Statistical Analysis: All the data was tabulated in excel spreadsheet, processed &analyzed. Mean & standard deviation were used to summarize the statistical significance of unpaired test & correlation co-efficient. Values of placental weight, number of cotyledons maternal & fetal surface area were expressed in mean standard deviation & site of umbilical insertion was expressed in %. All statistical variables were examined to compare the means of continuous difference between infants with low birth weight &normal birth weight as well as with the placental weight.

OBSERVATION: Comparison between normal birth weight and low birth weight:

	Age of mother	Weight of placenta	Fetal surface area	Maternal surface area	No of cotyledons	Weight of fetus
Mean	27.42	404.79	163.03	152.50	11.32	2287.87
± SD	3.64	19.37	12.01	13.16	2.3	156.58

Table 1: low birth weight (n = 38)

	Age of mother	Weight of placenta	Fetal surface area	Maternal surface area	No of cotyledons	Weight of fetus
Mean	29.23	547.83	245.78	251.60	14.63	2672.38
± SD	3.89	29.09	17.34	19.74	2.66	271.94

Table 2: normal birth weight (n = 65)

	Age of mother	Weight of placenta	Fetal surface area	Maternal surface area	No of cotyledons	Weight of fetus
t-test	2.33*	26.99***	25.98***	24.81***	6.41***	14.19***
P value	<.5	<.001	<.001	<.001	<.001	<.001

Table 3: Statistical Significance

	Age	Weight of placenta	Placental surface area	Maternal surface area	No. of cotyledons	Weight of infants
n	103	103	103	103	103	103
mean	28.56	495.06	215.25	208.73	13.41	2719.84
SD	3.88	74.01	43.03	46.6	2.99	406.76
SE	.38	7.29	4.24	4.59	0.29	40.08

Table 4: Data Summerization

DOI: 10.14260/jemds/2015/107

	Weight of placenta	Placental surface area	Maternal surface area	No.of cotyledons
r =	0.811	0.819	0.801	0.536
p =	< .001	< .001	< .001	< .001
significant	***	***	***	***

Table 5: correlation co-efficient (r) measures the strength of the relationship

In the present study morphometric parameters of the placentae of mothers aging between 22-39 yrs were recorded and correlated with previous workers. Out of 103 placentae studied 65 belonged to normal birth weight babies and rest38 were of low birth weight babies. Placentae were also categorized on the basis of duration of pregnancy into term placentae (98 cases) and post term (3 cases). Shape of the placentae is also noted at the time of delivery (96 were circular in shape whereas 7 were oval in shape). Central umbilical cord insertion was seen in 78.6% cases and peripheral insertion in remaining 21.4%.

A total number of 103 placentae were studied & their morphometric parameters were recorded & correlated with research work. In the present study the recorded data were categorized into low birth wt & normal birth wt. in this study out of 103 placentae 65 were included in normal birth wtrange & rest 38 were included into low birth wt category. Full term 98 cases post term 3 cases were included. Shape of the placenta is also noted at the time of delivery. Among all 103placentae 96 were circular & 7 were oval in shape. Umbilical cord attachment in center of placenta showed the majority value of 78.6% the peripheral attachment had the remaining21.4%. In the present study 103 placentae were examined out of which 38 were low birth wt & 65 normal birth wt. as seen in table 1&2 the age of mothers ranged between 22yrs-39yrs, with a mean of 27.42 (SD$\pm$ 3.64)in low birth wtandthenormalgroup showed a mean of29.23(SD $\pm$ 3.89)($p<0.5$).

All the morphometrical measurements of placentae were tabulated and statistically compared between low birth weight and normal birth weight babies. The statistical significance were shown in table 3.Inthepresentstudy the mean weight of placenta was found to be404.79$\pm$ 19.37 gms in low birthweight babiesand 547.83+_29.09 gmsinnormal birth weightbabies. In weight of placentaethestatisticaldifferences wereobserved in lowbirth weight and normal birth weight babies ($p<0.001$).

The mean weight of fetus was 2287.87$\pm$156.58gms in lowbirth weight and 2972.38+_271.97 gms in normal birth weight.The significant differences were observed between two groups($P<0.001$).Asseeninthetable1 and 2the mean values of the fetal surface area, maternal surface area and number of cotyledons are more in NBW babies. At the same time these value are less in low birth weight babies. Statistical significance were seen between all these parameters ($p<0.001$).

DISCUSSION: Growth and survival of the fetus is essentially dependent on development, formation, maturation and formation of the placenta (R.D Virupaxi, 2011).[11] Birth weight is the simplest parameter which serves as the most reliable indicator for the growth, development and sustenance of the neonate. Low birth weight is a major health problem in developing countries like India (Kalpana Chhetri, 2013).[12] In Obstetrics the relationship of birth weight and the perinatal outcome has long been appreciated, however an often neglected parameter is the morphology of the placenta, an organ which plays a keyrole for fetal growth (Pradeep S Londhe, 2012).[13]

DOI: 10.14260/jemds/2015/107

In present study mean weight of placenta is 547.83±29.09 gm. This is comparable with Gunapriya[14] et.al and also with Ifra[15] et.al. Gunapriya et.al (2011) had collected 101 placentae out of which 91 full term babies and 10 preterm babies. This study showed the average weight was 528.55 gm. Londhe et.al (2012) studied 374 placentae. The mean placental surface area was 184.0±61.6 sq.cm in SFA group (small for gestational age) which was lower than control group 219.7±41.6 sq.cm. Balihallimath et.al (2013)[15] studied 164placentae and mean placental surface area 225.7 sq.cm. In our study the placental surface area was 251.60±19.74 sq.cm which is slightly higher than the previous workers.

Kowsalya et al (2013)[16] reported the fetal surface area was152±37 sq.cm in low birth weight and 241±44 sq.cm in normal birth weight babies. Our study shows the fetal surface area is163.03±12.01 sq.cm in low birth weight and 245.78±17.34sq.cm in normal birth weight babies.

In present study, the mean no of cotyledons were 14.63±2.66in normal birth weight and 11.32±2.3 in low birth weight babies. Londhe et al (2011)[17] found that the no of cotyledons were 14.37±2.56 in hypertensive group and 16.09±1.90 in normal group of pregnancies. Chhetri et al (2013) reported that in normal birth weight, in 84 .2% (32 no) cases the mode of umbilical cord insertion was central, 72.7% (16 no) cases itwas marginal and 90% cases (27 no) cases its eccentric. In low birth weight, in 15.8% (6 no) cases the mode of umbilical cordinsertion was central, 27.3% (6 no) cases it was marginal and10% (3 no) cases it was eccentric. The present study of 103placentae in 81 placentae (78.6%) the umbilical cord insertion iscentral and in 22 placentae (21.4%) it was marginal.

CONCLUSION: The study on placenta is of great importance because this is the key point from where information about the fetus can begained. From this study it can be concluded that, in low birth weight baby all the placental parameter like its weight, its surface area, no of cotyledons etc are comparatively lower than the placenta of normal baby. So this theorem can be applied in detection of low birth weight before delivery through advanced diagnostic procedures like ultrasound, colour doppler imaging. Also measures can be taken to reduce low birth weight child delivery, associated with its complications and thereby reducing infant mortality rate.

REFERENCES:

1. Pouhg etal, Herpetology (1992). 3rd ed. Pearson Prentice Hall: Pearson Education Inc 2002.
2. Definitions of Placenta: Pearson Education Inc 2002.
3. Prendiville WJ, E L bourne D, Mc Donald (2000), Active versus expectant management in the 3rd stage of labour.
4. Mercier, JS and Vohr. B R (2010) Journal of perinatology, “Seven month developmental outcomes of very low birth weight infants enrolled in a randomized controlled trial of delayed versus immediate cord clamping. 30 (1): 1.
5. “Why eat a placenta” BBC 18th April 2006. Retrieved 8thJanuary 2008.
6. Barker DSP, Osmond C, Simmonds SJ. Fetal and placental size and risk of hypertension in adult life. BMJ, 1990 Aug 4; 301 (6746): 259-262.
7. Barker DJP, Bull AR, Osmond C, Simmonds SJ, BMJ1990; Fetal and placental size and risk of hypertension in adult life. 301, 259-262.

8. Cunningham FG, Leveno KJ, Bloom SL, Hauth JC, Gilstap LC lll, Wenstrom KD.: Williams Obstetrics 22ndedition 2005: Newyork; McGraw Hill, Implantation, embryogenesis and placental development; 39-90
9. Thomson AW, Billewicg WZ, Hytten FE, British Journal of Obst & Gynaec1969, The weight of the placenta in relation to birth weight; 76: 865-72.
10. Naeye RL . Hum Pathal 1987 Do placenta weights have clinical significance; 18: 387-91.
11. Adair FL, Thelandar H. A . Am J Obstet Gnecol 1925; Study of the weight and dimensions of the placenta in its relationto the weight of the newborn infant 10: 172-205.
12. Virupaxi RD, Potturi BR, Shirol VS, Desai SP, Hukkeri VB. Rec Res Sci Tech. (2011), Morphology of placenta and its Relation with small for Data Babies in 950 live Birth, 3: 123-126.
13. Kallpana Chhetri, Poonam Shilal, Binod Kumar Tamang. Journal of Evolution of Medical and Dental Sciences Vol. 2/issue 36. Sep 9, 2013; 6988-6994.
14. Pradeep S Londhe. Abhay B Mane: NJIRM 2012, Vol 3 (1) January – March, Placental morphometry in relation to Birth Weight of full term newborn babies.
15. Gunapriya R, Vijaylaxmi, Varsha S. JCDR 2011 A study on the morphology and the morphometry of the humanplacenta and its clinical relevance in a population in Tamilnadu: 282-86.
16. Ifra Saeed, Khadifa Qamar, Humaira Arsad Irumlqbal, Umbreen Noor; Journal of Rawalpindi Medical College: 2011; Foeto-Placental weight Relationship in NormalPregnancy and pre-eclampsia. 15 (1): 53-55
17. Rupa L Balihallimath, Veeereshkumar S Shirol, Anita M Gan Naresh Kumar Tyagi, Manisha R Bandankar: Journal of clinical and Diagnostics Research; 2013 Nov, vol – 7; 2428-2431.

AUTHORS:

1. Susmita Senapati
2. Lopamudra Nayak
3. Shashi Shankar Behera
4. Prafulla Kumar Chinara

PARTICULARS OF CONTRIBUTORS:

1. Tutor, Department of Anatomy, IMS & SVM Hospital.
2. Tutor, Department of Anatomy, IMS & SVM Hospital.
3. Associate Professor, Department of Obstetrics and Gynaecology, KIMS, KIIT, Bhubaneshwar.
4. Professor, Department of Anatomy, IMS & SVM Hospital, Bhubaneshwar.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Shashi Shankar Behera,
D-16, Staff Quarters,
KIMS, KIIT, Patia,
Bhubaneswar, Odisha.
E-mail: shashibehera1971@gmail.com

Date of Submission: 24/11/2014.
Date of Peer Review: 25/11/2014.
Date of Acceptance: 23/12/2014.
Date of Publishing: 16/01/2015.