



Contents lists available at BioMedSciDirect Publications

## International Journal of Biological & Medical Research

Journal homepage: [www.biomedscidirect.com](http://www.biomedscidirect.com)



### Original Article

# Morphological study of placenta in normal uncomplicated pregnancy in Gujarat region

<sup>a</sup>Jitendra P. Patel, <sup>b</sup>Ravi D Patel, <sup>c</sup>Ritesh K Shah, <sup>d</sup>Sanjay D Kanani, <sup>e</sup>Divyesh M Kapadia

<sup>a</sup>Department of Anatomy, Smt. NHL Municipal Medical College, Ellis bridge, Ahmedabad 380006 Gujarat India.

<sup>b</sup>M.B.B.S. Research Volunteer, Saint Michael's Medical Centre, Newark, NJ, USA

<sup>c</sup>Assistant Professor in Anatomy, GCS Medical College, Gujarat University, India.

<sup>d</sup>Assistant Professor in Anatomy, P.S. Medical College, Sardar Patel University, India.

<sup>e</sup>Assistant Professor in Anatomy, Smt. NHL Municipal Medical College, Gujarat University, India.

#### ARTICLE INFO

##### Keywords:

Placenta

Umbilical cord

Birth weight of baby

#### ABSTRACT

**Introduction:** The study was carried out to assess various morphological features of placenta such as weight, surface area, volume, attachment of umbilical cord etc. and further to find out any correlation between these parameters and birth weight of the baby. **Material and Methods:** The study was carried out selecting seventy mothers with uncomplicated pregnancy from indoor patients of gynaecology and obstetrics departments. All the measurements were taken by using standard measuring devices and standard measuring techniques. **Results:** The results show mean placental weight, surface area, volume is directly proportional to the weight of the baby with respect to attachment of the umbilical cord. The correlation coefficient for birth weight of baby from placental weight in centrally attached umbilical cord is 0.884, 0.651 in intermediately attached cord and 0.913 in marginally attached cord on placenta. The correlation coefficient for birth weight of baby from placental surface area in centrally attached umbilical cord is 0.785, 0.676 in intermediately attached cord and, 0.854 in marginally attached cord on placenta. The correlation coefficient for birth weight of baby from placental volume in centrally attached umbilical cord is 0.848, 0.789 for intermediately attached cord and, 0.895 for marginally attached umbilical cord on placenta. **Conclusion:** Values of placental weight, surface area, volume were found to correlate with birth weight of baby with respect to central, intermediate and marginal attachment of umbilical cord on placentas.

© Copyright 2010 BioMedSciDirect Publications IJBMR -ISSN: 0976:6685. All rights reserved.

### 1. Introduction

Placenta is the most accurate record of the infant's prenatal experience (K. Benirschke<sup>1</sup>, (1981)). After delivery if the placenta is examined minutely, it provides much insight into the prenatal health of the baby and the mother. Appropriate growth and development of the placenta is essential for fetal growth and wellbeing, and indeed may be an important factor in determining health in adulthood. As the fetus grows, its demands increase and the capacity of the placenta to facilitate transfer between the fetal and maternal circulations also increases as gestation progresses.

Pregnancy complications like hypertension or gestational diabetes are reflected in the placenta in a significant way (both macroscopically and microscopically). The study could help, to some extent, in assessing the relations between various placental parameters with growth of the foetus in terms of weight in normal full term pregnancies. Further, it was also tried to find out any correlation between placental weight, surface area and volume with weight of baby in relation to attachment of umbilical cord on the placenta.

\* Corresponding Author : **Dr Sandip Mukherjee**

Assistant Professor

Department of Physiology, Serampore College

Serampore, Hooghly - 712201, West Bengal, India

e-mail address: [sm\\_kdc@yahoo.co.in](mailto:sm_kdc@yahoo.co.in)

**2. Materials & Methods**

Seventy mothers with uncomplicated pregnancy were selected from indoor patients of Obstetrics and Gynecology Departments of V.S. Hospital (Smt. N.H.L. Municipal Medical College, Ellisbridge, Ahmedabad) and Civil Hospital (B.J. Medical College, Asarwa, Ahmedabad). The age range of these mothers varied from 20 years to 38 years and belonged to middle class families. For the purpose of study, freshly collected specimens from the labour room of the department of obstetrics and gynecology were preferred. These specimens were thoroughly rinsed with normal saline to remove any blood clots. Amniotic membrane was carefully removed from the surface of the placentas and attachment of umbilical cord on placentas was noted. The weight, surface area, volume, site of attachment of umbilical cord, number of cotyledons etc. of these placentas was noted. Care was taken to preserve the external features like placental septa, cotyledons and attachment of the umbilical cord.

**3. Results**

Out of total seventy placentas observed fifty had central attachment of umbilical cord, ten had intermediate attachment of cord and ten had marginal attachment of the cord. So the placentas were divided into these three groups and following observations were with respect to placental weight, placental surface area, placental volume, fetal weight and number of cotyledons (Table 1).

**Table-1: Mean birth weight and placental measurements with standard deviation and test of significance in three groups**

Baby and placental measurements	Attachment of umbilical cord						P value
	Central		Intermediate		Marginal		
	Mean	SD	Mean	SD	Mean	SD	
Birth weight (in gram)	2781	0.159	2549	0.065	2378	0.041	<.0001
Weight of Placenta (in gm)	477.44	15.696	469.5	22.292	432	16.193	<.0001
Placental surface Area (in sq cm)	268.02	18.657	256.5	23.406	224.8	16.651	<.0001
Placental Volume (in cm <sup>3</sup> )	582.7	21.481	564.5	20.609	536	15.776	<.0001
Ratio of fetal / placental weight	5.821	0.188	5.439	0.261	5.510	0.159	<.0001
Number of cotyledons	19.24	1.733	18.300	1.160	17.1	0.316	<.0001

It can be seen from table-1 that average values of baby weight, weight of placenta, surface area, volume and number of cotyledons are highest in placentas with central attachment of umbilical cords. At the same time these values are lower in placentas with intermediate attachment of umbilical cords and lowest in placentas with marginal attachment of the umbilical cords. The placentas with marginal attachment of the umbilical cord show low birth weight of the baby as well as lower placental weight.

**Table 2. Correlation coefficient and regression equation for birth weight of baby from placental weight.**

Attachment of umbilical cord	Correlation coefficient (r)	Regression equation	P value
Central	0.884	BWt= -1503.169 + (8.973) PWt	<.0001
Intermediate	0.651	BWt= -207.154 + (6.178) PWt	<.0001
Marginal	0.913	BWt= -1052.256 + (8.011) PWt	<.0001

**BWt – Birth weight of baby, PWt – Weight of placenta**

**Table 3. Correlation coefficient and regression equation for Weight of baby from placental surface area.**

Attachment of umbilical cord	Correlation coefficient (r)	Regression equation	P value
Central	0.785	BWt= 983.692 + (6.705) PSA	<.0001
Intermediate	0.676	BWt= 1246.272 + (5.609) PSA	<.0001
Marginal	0.854	BWt= 828.695 + (7.228) PSA	<.0001

**BWt – Birth weight of baby, PSA – Placental surface area**

**Table 4. Correlation coefficient and regression equation for Weight of baby from placental volume.**

Attachment of umbilical cord	Correlation coefficient (r)	Regression equation	P value
Central	0.848	BWt= -883.660 + (6.289) PV	<.0001
Intermediate	0.789	BWt= -769.351 + (6.060) PV	<.0001
Marginal	0.895	BWt= -1355.102 + (7.083) PV	<.0001

BWt – Birth weight of baby, PV – Placental volume

**Table 5: Comparison of Morphological findings of present study with other studies carried out on placenta**

Attachment of umbilical cord	Present study (2008)	Udainia A <sup>27</sup> et al. (2001)	Mazumdar S <sup>32</sup> et al. (2005)
Mean wt. of baby (in gram)	2735	2640	2800
Mean wt. of placenta (in gram)	474.1	495.0	485.85
Mean placental surface area (sq. cm)	264.43	242.56	265.15
Mean placental volume (in cm <sup>3</sup> )	578.917	NA	612.98
Ratio of fetal weight/placenta weight	5.763	NA	5.89
No. of cotyledons	18.967	NA	17
Marginal insertion of umbilical cord in %	8.33	NA	5.2

#### 4. Discussion

Morphological findings of present study were compared with those of earlier studies. Mean birth weight of baby in present study is 2.690 kg which is 2.64 kg in Udainia A<sup>13</sup> (2001) and 2.8 kg in Mazumdar S<sup>7</sup> (2005) (Table 5). Mean weight of placenta in present study is 469.78 gm, which are 495.0 gm in Udainia A<sup>13</sup> (2001) and 485.85 gm in Mazumdar S<sup>7</sup> (2005). Mean placental surface area in present study is 260.2 sq. cm which is 242.56 sq. cm in Udainia A<sup>13</sup> (2001) and 265.15 sq. cm in Mazumdar S<sup>7</sup> (2005). Mean placental volume in present study is 574 cm<sup>3</sup> which is 612.98 cm<sup>3</sup> in Mazumdar S<sup>7</sup> (2005).

Damania KR2 et al (1989) had studied sixty placentas of hypertensive disorders of pregnancy and had reported that birth weight, placental weight and feto-placental ratio were less in hypertensive cases than in the normotensive controls. Gupta S6 et al. (2012) shows that in case of mild, moderate and severe hypertensive mothers, the marginal attachment of umbilical cords are related to low birth weight of baby, most commonly noticed in the severe hypertensive sub-group. Sonographic study could also show clearly the site of insertion of the umbilical cord of the placenta and in hypertensive mothers, it was mostly marginal as confirmed by Pretorius9 et al (1996) and Di Salvo4 et al (1998).

Woods and Malan15 (1978) studied 940 placentas and found no correlation between the birth weight and the site of cord insertion in normal term infants. However, in the present study, in normotensive mothers placental size and site of attachment of umbilical cord correlated with average birth weight of babies. This is in conformity with findings of Thomson AM12 et al (1969) and

Younoszai and Haworth16 (1969) who reported that the placental weight and size are directly proportional to the birth weight. Shanklin DR11 (1970) noticed velamentous or marginal type of cord insertion in infants weighing less than 2500 gms.

Perceival8 (1980) has reported that in 73 percent of cases, the site of insertion of umbilical cord is eccentric in position (somewhere between the centre and edge of the placenta). In present study, eccentric attachment of umbilical cord was found in 28.56% of cases whereas Mazumdar S7 (2005) showed 5.2 % of placenta having marginal insertion on the umbilical cord. The association between marginal attachment of the cord with lower birth weight, placental weight, placental surface area and placental volume is statistically significant. The low birth weight may be explained by an altered distribution of fetal blood in the placenta as a result of different modes of arrangement of intracotyledonary vessels of placentas of complicated pregnancy (Rath10 et al 1994).

The correlation co-efficients were obtained which find significant correlation between different placental parameters and birth weight of babies. Table 2, 3 and 4 shows strong correlation between placental weight, surface area and volume with that of birth weight of baby in all the three types of umbilical cord attachments. Further the regression equations were obtained to correctly determine the baby weight with the help of other placental parameters. Goldberg5 et al. (1992) took serial measurements during pregnancy and showed that birth size can be only predicted by fetal measurements taken in third trimester. Clappe3 et al (1995) reported an association between second

trimester placental volume and birth weight; same was also showed by Wolf<sup>14</sup> et al (1985). The regression equations obtained in our study can be used to predict weight of the foetus using sonographic measurements of placenta in Gujarat region.

From the above study it is clear that measurement of different placental parameters during pregnancy can help in predicting the birth weight of baby. Further it may be helpful in early identification and management of the foetus at risk at the time of birth and thereafter.

**5. Conclusions:**

Values of placental weight, surface area, volume were highest in placentas with central attachment of umbilical cord, lower in placentas with intermediate attachment of umbilical cord and lowest in placenta with marginal attachment of umbilical cord. These parameters are found directly proportional to the birth weight of the babies. Measurement of the placental parameters can be done by non-invasive technique like ultrasonography which could help in assessing the development of the baby.

**ACKNOWLEDGEMENT:**

We are thankful to Mr. Jignesh Garsondiya (Assistant Professor and statistician, Department of Community Medicine, GCS Medical College) who tirelessly helped us in statistical analysis of the data.

**6. References**

[1] Benirschke K.: The placenta: How to examine it and what you can learn – Contemp Obst and Gynaecol, 1981; 17: 117-119.

[2] Damania, K.R, Salvi, VS, Ratnaparkhi, S.K. Daftary, S.N.: The placenta in Hypertensive disorders of pregnancy. Journal of Obstetrics and Gynaecology of India: 1989; 39: 28-31.

[3] Clappe JH, Rizk KH, Appleby-Wineberg SK, Grass JR. second trimester placental volume predicts birth weight at term. J soc Gynecol Investig 1995; 2:19-22

[4] DiSalvo, D.N; Benson, C.B; Laing, F.C; Brown, D.L; Frates, M.C; Doubilet, P.M.: Sonographic evaluation of the placental cord insertion site. American Journal of Roentgenology: 1998; 170: 1295-1298.

[5] Goldberg RL, Cliver SP, Neggars Y, Copper RL. The relationship between maternal characteristics and fetal and neonatal anthropometric measurements in women delivering at term. Acta Obstet Gynecol 1992; 165: 8-13.

[6] Gupta S and Gupta P. correlation of placental weight and fetal outcome in pregnancy induced hypertension. 2012; 14 B(19), 502-504.

[7] Majumdar S, Dasgupta H, Bhattacharya K, Bhattacharya A.: A Study of Placenta In Normal and Hypertensive Pregnancies. J.Anat.Soc. India: 2005; 54 (2) 1-9.

[8] Perceival, R. "Holland and Brews, Manual of Obstetrics" In: Chorion and placenta with placental Ischaemia. 14th Edition. The English Language Book Society and Churchill Living Stone, 30-50. (1980)

[9] Pretorius DH, Chau C, Poeltler DM, Mendoza A, Catanzarite VA, Hollenbach KA. Placental cord insertion, visualisation with prenatal ultrasonography. J Ultrasound Med, 1996; 15: 585 – 593.

[10] Rath, G; Garg, K; Anand, C; Kawle, M.: Vascular pattern of human placenta in complicated pregnancy; A corrosive cast study. Annals of the National Academy of Medical Sciences (India): 1994; 30: 17-22.

[11] Shanklin, D.R.: The influence of Placental lesions on the Newborn Infant: Pediatric Clinics of North America: 1970; 17, 25-42.

[12] Thomson, A.M; Billewicz, W.Z; Hytten, F.E: The weight of the placenta in relation to birth weight. Journal of Obstetrics and Gynaecology of British Common wealth.: 1969; vol.76, 865-872.

[13] Udainia, A; Jain, M.L.: Morphological Study of Placenta in Pregnancy Induced Hypertension with its Clinical Relevance. Anat. Soc. India.: 2001; 50(1) 24-27.

[14] Wolf H, Oosting H, Treffers P. Second trimester placental volume measurement by ultrasound prediction of fetal outcome. Am J Obstet Gynecol 1985; 160: 121-6.

[15] Woods, D.L; Malan, A.F.: The site of Umbilical cord insertion and Birthweight. British Journal of Obstetrics and Gynaecology: 1978; 85, 332-333.

[16] Yousonszai & Haworth. Placental dimensions and relations in pre-term and growth retarded infants. Ame.J. Obst Gynaecol 1969;103: 265-271.