

Comparative Study on Macroscopic Morphology of Human Placenta in Preterm, Term & Post Term Pregnancy

Dr. Nikhat Ghani¹, Dr. Kanti Yadav^{2§}

¹Resident Doctor, Department of Obstetrics and Gynecology, JLN Medical College, Ajmer (Rajasthan), India

²Senior Professor & Head, Department of Obstetrics and Gynecology, JLN Medical College, Ajmer (Rajasthan), India

[§]Corresponding author's Email: nikhat.ghani@gmail.com

Abstract— *Pregnancy is highly precious for every couple but presence of risk factors that cause prematurity, post maturity and various other conditions that complicate the pregnancy have adverse effects. Gross examination of the placenta may provide useful information about the etiology of newborn and maternal complications. Hence it is important to study relationships between placental abnormalities, gestational age and occurrence of adverse outcome. So, this study aims to compare the macroscopic morphology of human placenta in preterm, term and post-term pregnancy. A hospital based comparative observational study conducted on placentae of 40 pre-term, 40 term and 40 post-term. Shape, weight, diameter, thickness, mode of insertion of umbilical cord, number of cotyledons and arrangement of chorionic vessels was observed of each placenta included in the study. These variables of palcentae were compared as per pre-term, term and post-term. Significance of difference was determined by Chi-square test. This study revealed that most of the placentae were discoidal in shape. And the weight as well as diameter of the term placentae were significantly more from preterm placentae. Likewise weight and diameter both of the post term placentae were significantly more form term placentae. Regarding thickness of placentae, term placentae thickness were more from preterm placentae and post-term placentae were more from term placentae but it was found significant in term to preterm not in term to post-term. So it can be concluded from this study that as gestational period increases weight, diameter and thickness of placenta increases. Observing the facts, more studies are suggested to explore the other variables related to placenta and its relation to pregnancy outcomes.*

Keywords: *Placenta, Macroscopic anatomy of Placenta, Pregnancy Outcomes.*

I. INTRODUCTION

The placenta is a mirror which reflects the intrauterine status of the foetus. It is a vital organ for the maintenance of pregnancy and helps in promoting normal foetal development. It is an organ that connects the developing foetus to the uterine wall. It is a critical organ responsible for providing nutrient uptake, waste elimination, and gas exchange between mother and fetus¹. The placenta also produces vital hormones such as progesterone and human chorionic gonadotrophin that helps in maintaining the pregnancy¹. Abnormal placenta adversely affects the fetal outcome. Usually a placenta is round or oval in shape and is relatively flat, discoid. However the shape may be irregular, star shaped bi-lobate, multi-lobate, circumvallate, circummarginate and many more.

Placenta weighs about one sixth of that of the fetus. The maternal surface of the placenta is composed of the decidua, the uterine lining during pregnancy. Also visible on the maternal surface are lobules, approximately 15 to 20 called cotyledons, divided by deep channels more called as sulci. Each individual lobule is divided into smaller sections containing one villi. These villi are the same ones emerging from the chorion, containing fetal capillaries, which bathe in the intervillous space. Embedded

in the decidua are maternal veins and arteries that end in the intervillous space. They are also in continuous with the maternal circulation.

Preterm labour, or premature labour, is the early onset of uterine contractions before 37 weeks and after 20 weeks of gestation.² Preterm birth is the primary cause of perinatal mortality and morbidity. The American College of Obstetricians and Gynaecologists (2016)³ defined preterm labor or premature labor as regular contractions of the uterus resulting in changes in the cervix that starts before 37 weeks of pregnancy. Changes in the cervix include effacement and dilation so that the fetus can enter the birth canal. Morphologically the placentas of preterm deliveries are lighter in weight, have a lesser diameter and thickness, with a higher incidence of abnormal shape and cord insertion.

Post term pregnancy refers to pregnancy longer than 42 weeks of gestation. The risk of intra uterine death of foetus, birth asphyxia in labour and shoulder dystocia increases with post maturity. The risk of still birth is about one in one thousand after 42 weeks of gestation and it increases to one in 500 pregnancies after 43 weeks of gestation. The placentae in case of post term deliveries are affected grossly. These placentae are unusually heavy. In pregnancy beyond 43 weeks of gestation placentae are heavier than the normal placentae attributed to compensatory hyperplasia of the villi. Placenta is considered as a leading cause of maternal and perinatal mortality and important factor affecting foetal growth which is generally associated with placental insufficiency.

This study was conducted to compare the morphological features of preterm, term and post term placentae in our setup.

II. METHODOLOGY

This hospital based comparative observational study was carried out in the Department of Obstetrics and Gynaecology, Rajkiya Mahila Chikitsalaya, JLN Medical College, Ajmer (Rajasthan) India, in the year 2017.

Study population: This study was done on placentae which were collected from women who were delivered at Rajkiya Mahila Chikitsalaya, Ajmer.

For study purpose, placentae were collected from women between 18-40 years of age including both primigravida and multigravida up to 4th gravida having singleton pregnancy with live birth only. Women with history of any medical or obstetric illness such as Anaemia, Diabetes, Hypertensive disorders of pregnancy etc were excluded from the study. Women with placental morbidity like adherent placenta, abruption placenta, retained placenta and placenta of twin pregnancy were also excluded.

Thus 40 placentae from each of following three groups were taken:-

- Preterm: 28 weeks to 36 weeks gestational period
- Term: 37 weeks to 42 weeks gestational period
- Post Term: Beyond 42 weeks gestational period

The gestational period as well as the expected date of delivery was calculated from the date of 1st day of last menstrual period by adding nine calendar months and seven days to it (Naegele's formula).

Method: All the relevant information of the mother such as age, duration of pregnancy, gravida, parity and other details were recorded in predesigned semi-structured Performa. Then after delivery, the

placenta of selected women was collected in a clean tray. The umbilical cord was cut short to about 2 inches then gently pressed so as to remove as much blood as possible without injuring it, then gently washed with water to remove excess blood clots and amniotic debris. Placenta was examined macroscopically for

1)Shape. 2)Weight. 3)Diameter. 4)Thickness.

The weight of the placenta was taken on an accurate commercial scale weighing machine. The diameter of the placenta was determined by measuring tape and recorded in centimeters. The placenta was placed in a flat tray after trimming. At first, the maximum diameter was measured. Then the second maximum diameter was taken at right angle to the first one. The mean of the two measurements was considered to be the diameter of the placenta expressed in centimeters. Thickness of placenta was measured at the centre with the help of a long needle and it was marked and then measured.

Statistical analysis: Qualitative data will be compared by Chi square test. Unpaired t test will be used to infer the difference in means. For significance, “p” value <0.05 was accepted as significant.

III. RESULTS

In this study following were the salient observations as per the variables of this study.

Shape of placenta: The shapes of placenta were almost found to be discoid in shape as round in 55.83% cases and oval in 44.17% cases distributed almost evenly in all the three groups, namely – preterm, term and post-term placentae. (Table 1)

Table 1
Shape of placenta wise distribution of study population

Shape	Preterm No. (%)	Term No. (%)	Post term No. (%)	Total No. (%)
Round	22(55%)	23(57.5%)	22(55%)	67(55.83%)
Oval	18(45%)	17(42.5%)	18(45%)	53(44.17%)
Total	40	40	40	120

Weight: In this study, in preterm group, maximum cases (45%) had placental weight in the range of 250 – 300 gm. The mean weight was found to be 329.87 ± 49.56 gm. Whereas in term group, it range between 300-525gm. Mean Term placental weight observed was 429.12 ± 55.35 gm. And in post term placenta was found between 395-595gm with the mean 461.5 ± 53.49 gm. (Table 2)

When weight of placenta was compared between groups it was found that difference of weight between preterm and term categories was found to be significant ($p < 0.001$). Difference in weight of placenta between term and post-term was also found significant ($p = 0.0095$). (Table 2)

Diameter: The diameters in placentae of preterm cases were found to range between 14.5-17.8 cm with the mean diameter being 15.97 ± 0.87 cm. In majority cases (57.5%), placental diameter was in the range of 16-17.9cm. Whereas in term placenta found was between 15 to 20 cm with the mean diameter as 17.44 ± 1.41 cm. And in post term placenta was found to be 17-20.5cm. Mean diameter was 18.25 ± 0.97 cm. (Table 2)

When diameter of placenta was compared between groups it was found that difference of diameter between preterm and term categories was found to be significant ($p < 0.0001$). Difference in diameter of placenta between term and post-term was also found significant ($p = 0.0038$). (Table 2)

Table 2
Mean Placental Morphometric Study

Placental Parameters	Term (A) Mean ± SD	Preterm (B) Mean ± SD	Post term (C) Mean ± SD	't' Test (A &B) P Value LS	't' Test (A &C) P Value LS
Weight (gm)	429.12±55.35	329.87±49.56	461.5 ± 53.49	t =8.4480 p<0.0001 S	t =2.6599 p=0.0095 S
Diameter (cm)	17.44±1.41	15.97±0.87	18.25 ± 0.97	t =5.5637 p<0.0001 S	t =5.5637 p=0.0038 S
Thickness (cm)	2.09±0.25	1.79±0.21	2.17 ± 0.36	t =5.6678 p<0.0001 S	t =1.1992 p=0.2341 NS

Thickness: In present study, thickness in preterm placentae ranges between 1.5-2.3cm with the mean thickness as 1.79 ± 0.21 cm. Whereas in term cases, it was found to range between 1.6 to 2.7cm, with the mean as 2.09 ± 0.25 cm. And in post term placenta was between 1.5-3.0 cm, the average being 2.17 ± 0.36 cm. (Table 2)

When thickness of placenta was compared between groups it was found that difference of thickness between preterm and term categories was found to be significant ($p<0.0001$). But difference in thickness of placenta between term and post-term was found not significant ($p=0.2341$). (Table 2)

IV. DISCUSSION

Here observations of this study were discussed with observations made by other authors as per variable of the study.

Shape of placenta: The shapes of placenta were almost found to be discoid in shape as round in 55.83% cases and oval in 44.17% cases distributed almost evenly in all the three categories, namely – preterm, term and post-term placentae in this study. This finding is supported by Arey (1966)⁴, Dutta(2010) et al.⁵ Soni et al in 2017⁶ found that 42.30 percent placentae were of round shape, 37.5 percent placentae were of oval shape and the rest 20.19 percent were of irregular shape. In 2011, in a study conducted by G. Rangunath and Vijayalakshmi⁷, 93 percent of placentae belonged to round shape and 7 percent were oval shaped. Hatibaruah et al., 2015⁸ found in their study of 90 placentae that most of the placentae were discoidal in shape.

Weight of Preterm Placentae: In this study, in preterm group, maximum cases (45%) had placental weight in the range of 250 – 300 gm. The mean weight was found to be 329.87 ± 49.56 gm. In 2015, Sherin F. et al⁹ found mean weight of preterm placenta to be 408.44gm. In 2013, Zaidi, M. T et al¹⁰ found mean weight of preterm placenta as 352.77gms. In the present study, the weights of placentae in preterm cases were in the range from 265–425 gms.

Diameter in Preterm Placenta: The diameter in placentae of preterm cases were found to range between 14.5-17.8 cm with the mean diameter being 15.97 ± 0.87 cm. In majority cases (57.5%), placental diameter was in the range of 16-17.9cm. The above finding is supported by Hatibaruah et al., 2015⁸ who reported mean diameter of pre term placenta as 15.70 ± 0.83 cm. In 2015, Sherin F. et al⁹ found mean diameter of preterm placentae as 11.69cm.

Thickness in preterm placenta: In present study, thickness in preterm placentae ranges between 1.5-2.3 cm with the mean thickness as 1.79 ± 0.21 cm. In 2015, Sherin F. et al⁹ observed mean thickness of

preterm placenta as 1.60cm. In 2006 Zaidi, M. T et al¹⁰ observed mean thickness of preterm placenta to be 1.612 cm.

Weight in Term Placenta: The weight of placentae in Term cases was found to range between 300-525gm. Mean weight observed was 429.12 ± 55.35 gm. In 2017, Soni S. et al⁶ found the average weight of term placenta as 468.4gm, ranging from 342-568gm. Sherin F. et al⁹ (2015) found it to be 513.38gm. D C Dutta¹¹ (2015) reported it as 500gm. T W Sadler¹² (2014) found it between 500-600gm. Zaidi, M. T. et al¹⁰ (2013) stated it as 513.16gm. A.K.Dutta⁵ (2010) stated it as 500gm.

Methodology of preparation, weighing of placenta together with cord clamp time may lead to variations in the mean weight of placenta.

Diameter in Term Placenta: In the present study, diameter of term placenta found was between 15 to 20 cm with the mean diameter as 17.44 ± 1.41 cm. In 2017, Soni S. et al⁶ found the diameter of term placenta to range between 15-25cm. Sherin F. et al⁹ (2015) stated it as 15.07cm. D.C.Dutta¹¹ (2015) found it as 15-20cm. T.W.Sadler¹² (2014) reported it as 15-25cm. A.K. Dutta⁵ (2010) found it as 15-20cm.

Thickness in Term Placenta: Thickness in placenta of term cases range between 1.6 to 2.7cm, with the mean as 2.09 ± 0.25 cm. In 2017, Soni S. et al⁶ reported that a normal placenta is 3cm thick at term. Sherin F. et al⁹ in 2015 found it as 2.14cm. Zaidi, M. T. et al¹⁰ (2013) reported it as 2.1cm.

Weight of Post Term Placenta: Weight of post term placenta was found between 395-595gm with the mean 461.5 ± 53.49 gm. Hatibaruah et al., 2015⁸ reported mean weight of post term placenta as 457.86gm. In 2015, Sherin F. et al⁹ found mean weight of post mature placentae to be 689.26 gm.

Diameter of Post Term Placenta: Diameter of post term placenta was found to be 17-20.5cm. Mean diameter was 18.25 ± 0.97 cm. In 2015, Sherin F. et al⁹ found mean diameter of post term placenta to be 19.67cm.

Thickness of Post term Placenta: In 2015, Sherin F. et al⁹ observed in their study that mean thickness of post term placenta was 3.14cm. In our study, the thickness of post term placenta was between 1.5-3.0 cm, the average being 2.17 ± 0.36 cm.

V. CONCLUSION

This study concludes that irrespective of preterm, term or post term placentae, most of the placentae were discoidal in shape. And it can also be concluded from this study that as gestational period increases weight, diameter and thickness of placenta increases.

More studies are needed to explore the other variables related to placenta and its relation to pregnancy outcomes.

CONFLICT OF INTEREST

None declared till now.

REFERENCES

- [1] Blackburn, S. Maternal, Fetal & Neonatal Physiology. 4th ed.. Saunders; Maryland Heights: 2013. Prenatal Period and Placental Physiology; p. 79-85
- [2] Williams Obstetrics F. Gary Cannigham ,Keneth J Leveno ,Steven L Bloom , Jhon C Hauth ,Larry C Gilstrap ,Katharine D. Wenstrom 22nd edition 552-860
- [3] Women's Healthcare Physicians. The American College of Obstetricians and Gynecologists. FAQ087; 2016.
- [4] Arey L.B (1966): "Placentation", 7th edition, WB Saunders Company, Philadelphia & London Toppan Company Ltd, Tokyo, Japan M2-M3.
- [5] Dutta A.K (2010): "The placenta" Essentials of Human Embryology, 6th edition, Current Books international, Kolkata, Mumbai, pp58-70.
- [6] Soni S, Bhardwaj K, Garg S, Mishra S.K. Study of arterial pattern of normal human placenta in reference to its shape, weight and Hyrtl's Anastomosis. *Int J Med Res Rev* 2017;5(05):455- 461. doi:10.17511/ijmrr. 2017.i05.03.
- [7] Raghunath, G. and Vijayalakshmi, V. S. (2011). A study on the Morphology and the Morphometry of the Human Placenta and its Clinical Relevance in a population in Tamilnadu. *Journal of clinical and diagnostic research*, 5(2): 282-286.
- [8] Alpana Hatibaruah (June 2015). A Study on Macroscopic Anatomy of Human Placenta. *Journal of Evidence Based Medicine And Healthcare*, 2 (25), 3673-3687
- [9] Fatima Sherin, Ejaz Afzal, Nighat Seema:GROSS MORPHOLOGICAL CHANGES IN PREMATURE AND POST MATURE HUMAN PLACENTAE.J Ayub Med Coll Abbottabad 2015;27(2):448-450
- [10] ZAIDI, M. T.; ARSHAD, M.; VASENWALA, S. M.; FARUQI, N. A.; KHAN, A. A. & KHAN, S. Histomorphometry of preterm and term human placentas. *Int. J. Morphol.*, 31(2):409-413, 2013.
- [11] Dutta DC (2015): "The placenta and fetal membranes" Textbook of Obstetrics, 8th edition, New Central Book Agency (P) Ltd, Calcutta pp. 32-45.
- [12] Sadler T W(2014): "The fetus and placenta" Langman's Medical Embryology, 12th edition, Lippincott Williams & Wilkins New Delhi, Philadelphia, Baltimore New York, London, Buenos Aires, Hong Kong, Sydney, Tokyo pp. 96-109.
- [13] F Shehata,a I Levin,b A Shrim,a B Ata,a B Weisz,c R Gamzu,b B Almoga. Obstetrics and Gynecology Department, McGill University Health Centre, McGill University, 687 Pine Avenue. Placenta/birth weight ratio and perinatal outcome: a retrospective cohort analysis. West, Montreal, QC H3A 1A1, Canada. Accepted 16 December 2010. Published Online 18 February 2011
- [14] Panti, A. A., Ekele, B. A., Nwobodo, E. I. and Yakubu Ahmed (2012). The relationship between the weight of the placenta and birth weight of the neonate in a Nigerian Hospital. *Nigeria Medical Journal* 2012 April-June, 53(2): 80-84.
- [15] Udainia A, Bhagwat SS, Mehta CD. Relation between placental surface area, infarction and foetal distress in pregnancy induced hypertension with its clinical relevance. *J Anat Soc India*. 2004;53(1):27- 30. DOI: 10.5455/2320-601.