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An Observational Study on Ultrasonographic Measurement of Placental Thickness in Term Pregnancy and its Association with Estimated Foetal Weight and Actual Birth Weight

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Abstract

Introduction: The placenta exhibits important metabolic, endocrine and immunological functions. The measurement of placental thickness is relatively simple, clinically useful and considered as the easiest placental dimension to measure. Evaluation of placental thickness in third trimester could help to determine normal development, function of placenta and can be a good predictor of foetal growth and birth weight. The present study was designed to measure the placental thickness in third trimester of pregnancy on trans-abdominal ultrasound and to find the correlation between placental thickness and foetal weight (as estimated with trans-abdominal ultrasound) and actual birth weight (measured after birth with a paediatric weight scale).

Methods: 100 pregnant women with singleton, live uncomplicated pregnancy with gestational age between 37 to 40 weeks, who were sure of their dates and who consented to participate were included in the study. Placental thickness was measured in mm trans-abdominally by placing ultrasound transducer perpendicular to the plane of placenta in the area of cord insertion near mid-placental portion at third trimester. All women were monitored till delivery. All data were entered into MS excel sheet and analysed.

Results: Pearson correlation indicated that there is a significant large positive relationship between Placental Thickness and Estimated Birth weight, (r) = .688, p < .001). There is a significant large positive relationship between Placental Thickness and Actual Birth weight, (r) = .647, p < .001).

Conclusion: Determination of placental thickness by USG can be a screening tool as deviation from normal value can give a clue to underlying foetal or maternal pathology.

Keywords: Ultrasonography, placental thickenss, third trimester, estimated foetal weight, actual birth weight

Introduction

Placenta is a discoid shaped foetal organ that serves as the physiological bridge between mother and foetus. It exhibits important metabolic, endocrine and immunological functions. It also serves as a passage for nutrition and respiration[1]. The placenta starts developing on 5th week from the chorionic villi at the site of implantation and has two basic components: the maternal and foetal portions. The placenta originates from the foetal portion (Chorion Frondosum) and maternal portion (Endometrium) more specifically from the Decidua Basalis[2]. The placenta can be seen through ultrasound by 9th to 10th week. At 16th week the placenta reaches its ultimate thickness and continues to grow in diameter until the end of the third trimester[3].

Human placenta is hemochorial, discoid and deciduate[4]. At term, the placenta has a diameter of 15 to 25 cm and is approximately 3 cm thick and weighs about 500 to 600 gms[5]. Placental and foetal weights are closely correlated in most circumstances, and it follows nearly a linear pattern except during the past few weeks of gestation[6]. Placental growth can be estimated by measuring the thickness or placental volume.

Estimation of foetal weight is important for antenatal and intrapartum clinical decision-making. It is an important component of maternal care, especially in counseling, differential diagnosis, and planning for delivery[7,8]. Foetal weight estimation is a vital parameter which is not only used in the management of labour and deliveries but also routinely used during antepartum period to evaluate high-risk pregnancies such as diabetic pregnancy, post term pregnancies, hypertensive disorders in pregnancy, vaginal birth after a previous cesarean delivery, and intrapartum management of foetuses with malpresentation. Management of these clinical conditions is likely to be influenced by the estimated foetal weight (EFW)[9]. Birth weight has been reported to be the single most important parameter that determines neonatal survival[10].

The main method of estimating foetal weight in current obstetrics practice is by ultrasonography. Foetal weight can be estimated by using Shepard method with two biometric parameters (BPD and AC) and Hadlock method with four biometric parameters (BPD, HC, AC and FL)9. Estimating gestational age becomes problematic when foetal growth markers such as head circumference, abdominal circumference, femur length, and biparietal diameter cannot be detected. Biparietal

diameter cannot be precisely evaluated in situations like multiple gestation, breech presentation, and ruptured membranes since these factors may cause the foetal head to change shape[3].

The measurement of placental thickness is relatively simple, clinically useful and considered as the easiest placental dimension to measure[11]. Placental thickness of 2.5cm to 3.75cm is taken as normal. A placental thickness of 4 cm or more is regarded as abnormal[12]. An excessively large placenta maybe associated with infection, anaemia and triploidy[13]. Thickened placentas, suggest Primary maternal Cytomegalovirus infection and fetal disease[14]. Growth retardation is associated with Placental thickness of less than 2.5 cm. while Diabetes Mellitus, fetal hydrops and intrauterine fetal infections is associated with thick placentas[15].

Placental thickness linearly increases with gestational age throughout a normal pregnancy. In situations of central or near-central cord insertion, accurate measurements should be taken in the midportion of the placenta near the umbilical cord insertion and must be taken perpendicular to the uterine wall from the sub-placental veins to the amniotic fluid while excluding the myometrium[16].

Foetal weight estimates are important because a significant proportion of perinatal mortality is related to birthweight and evaluation of placental thickness in third trimester could help to determine normal development, function of placenta and can be a good predictor of fetal growth and birth weight[17]. Very few studies have been done in our state to find correlation between placental thickness and estimated foetal weight and actual birth. Keeping this in mind the present study was designed to observe the placental thickness in third trimester of pregnancy and to find the correlation between placental thickness (as estimated with trans-abdominal ultrasound) and foetal weight (as estimated with trans-abdominal ultrasound) and actual birth weight (measured after birth with a pediatric weight scale).

Materials and Methods

This was a hospital based descriptive type of observational study done in the Department of Obstetrics & Gynaecology, SMS Medical College and attached Hospitals, Jaipur. 100 pregnant women with singleton, live uncomplicated pregnancy with gestational age between 37 to 40 weeks, who were sure of their dates and who consented to participate were included in the study. Women with medical disorders, congenital malformation of the foetus, polyhydramnios/ oligohydramnios, placenta previa/placental anamolies, uncertain and unreliable dates were excluded from the study.

Detailed history was taken. A thorough general physical, systemic and obstetric examination done. Patients were sent for ultrasound examination after taking informed and written consent. Placental thickness was measured in mm trans-abdominally by placing ultrasound transducer perpendicular to the plane of placenta in the area of cord insertion near mid-placental portion at third trimester. The calculation of placental thickness was done from echogenic chorionic plate to placental myometrial interface. All placental measurements were taken during relaxed phase of uterus as contractions can spuriously increase placental thickness. Estimated foetal weight derived by ultrasound using hadlocks formula. If the patient doesn't deliver within 7 days then repeat scan was done for placental thickness so on till she delivers within 7 days of placental thickness measurement. All women were monitored throughout labour. Actual birth weight

of baby was measured immediately after birth using a paediatric weight scale.

Gestational age at delivery, need for induction, mode of delivery birth weight, APGAR score, NICU admission any perinatal mortality was also noted. Maternal and perinatal outcome noted till the time of discharge.

Results

Table 1 shows that majority of the women in our study were in age group 20 – 30 years (73%) followed by 30 - 35 years (18%). Mean age of the women in present study was 26.4 ± 4.76 years. Majority of the women (50%) in present study were primigravida followed by second gravida (28%). (Table 2)

Table 3 shows mean placental thickness according to gestational age. Mean placental thickness was 2.44 ± 0.35 cm at GA 37 weeks to 37 weeks 6 days, 3.03 ± 0.22 cm at 38 weeks to 38 weeks 6 days, 3.77 ± 0.54 cm at 39 weeks to 39 weeks 6 days and 4.31 ± 0.87 cm at 40 weeks. Mean placental thickness increases as gestational age increases.

Table 4 shows distribution according to placental thickness and mean estimated and actual birth weight. When placental thickness was between 2.0 to 2.5 cm by USG the mean estimated foetal birth weight was 2.26±0.14 kg. and when placental thickness was 5.0 cm and more the mean estimated foetal birth weight was 3.64±0.22 kg. With increase in placental thickness there is increase in estimated foetal birth weight. When placental thickness was between 2.0 to 2.5 cm by USG the mean actual birth weight was 2.16±0.11 kg kg and when placental thickness was 5.0 cm and more the mean actual birth weight was 3.26±0.19 kg. With increase in placental thickness there is increase in actual birth weight.

Pearson correlation indicates that there is a significant large positive relationship between Placental Thickness and Estimated Birth weight, (r) = .688, $p < .001$) and Actual Birth weight, (r) = .647, $p < .001$). (Table 5, Graph 1 & 2)

Discussion

Placental thickness appears to be a promising parameter for estimation of weight of the fetus because of increase in placental thickness with advancing gestational age[18]. Majority of the women in present study (73%) were in age group 20 – 30 years which is in line with observation made by Ismail KS et al[19] where most of the women were in age group between 21 to 30 years. Mean age of the women in present study was 26.4 ± 4.76 years. The observation made in present study was in line with observation made by Noor N et al[18], Alka patil et al[20] and Gabr MA et al[21] but in contrast with the study done by Nagpal K et al[21] where mean age of the women was 23.1 ± 3.02 years.

In present study 50% women were primigravida and 28% women were second gravida. Observation made in present study was in line with study done by Khajjayam A et al[22] 60.8% women were primigravida, 29.7% were second gravida patients and in contrast with the result of Ashmawy NE et al[23] where 20% women were primigravida and 80% were multigravida.

Mean placental thickness increases as gestational age increases. Mean placental thickness was 2.44 ± 0.35 cm at GA 37 weeks to 37 weeks 6 days and it was increased to 4.31 ± 0.87 cm at 40 weeks. The mean placental thickness at different GA in present study was comparable with mean placental thickness at same gestational age observed by Ashmawy NE et al[23] and Ohagwu C. C. et al[15] but in contrast with observation made by Sumanta et al[24].

In present study it was observed that with increase in placental thickness there is increase in estimated foetal birth weight as well as actual birth weight. This is inline with observations made by Ashmawy NE et al[23] in their study though mean estimated birth weight and actual birth weight were in present study were lower than mean estimated birth weight and actual birth weight observed in the study done by Ashmawy NE et al[23]

There was a significant large positive correlation between Placental Thickness and Estimated Birth weight, (r) = .688, p < .001) as well as between Placental Thickness and Actual Birth weight, (r) = .647, p < .001). The result of present study is consistent with observations made in various studies done in the past[21,24-29]. Usually, during obstetric ultrasound examination, the placenta used to be examined only for its location and position. However, nowadays, due to detailed ultrasonography, we can detect the morphological changes of the placenta as the placenta matures. As the gestational age advances, the placental thickness also increases gradually. So abnormal thick or thin placenta should be evaluated and correlated with other parameters for the pregnancy duration estimation[30]. Placental thickness appears to be a promising parameter for the estimation of gestational age because of the linear increase in placental thickness with advancing gestational age.

Conclusion

Placental thickness measured at the level of umbilical cord insertion can be used as an accurate sonographic indicator in the assessment of gestational age and estimation of foetal weight because of its linear correlation. Determination of placental thickness can be a screening tool as deviation from normal value can give a clue to underlying foetal or maternal pathology. This rests on the fact that placenta is a key organ and pathological changes can be seen here much before they appear clinically or biochemically.

Therefore, it can be used as an additional sonographic tool in predicting new born birth weight and identify the foetus in danger of being low birth weight. Measurement of placental thickness should therefore be carried out routinely during obstetrics ultrasound scan.

References

1. Robinson, E. D., and Alasia Osuoabo, S. Foetal weight determination using sonographic measurement of placenta thickness. The Nigerian Health Journal 2019; 18: 45-53.
2. Balla EA, Ahmed MS, Ayad CE, Ahmed AS. Prediction of fetal growth by measuring the placental thickness using ultrasonography. J Gynecol Obstet. 2014 Apr 9;2(2):26-31.
3. Ahmad, M., Anjum, M.N., Asif, M., Ayub, S., Muzffar, A., Mubeen, I., (2021). Placental thickness and its correlation to gestational age estimated by foetal growth parameters-a cross sectional ultrasonographic study. Biol. Clin. Sci. Res. J., 2021: 59. doi: https://doi.org/10.54112/bcsrj.v2021i1.59]
4. C.S. Dawn. The placenta, fetal membranes, liquor amnii, umbilical cord. C.S.Dawn. Dawn textbook of obstetrics and neonatology. 16th edition, 2004. Kolkata. 40-41.
5. Sadler TW (2004). Langman's medical embryology. 9th Edition. Baltimore, MD: Lippincott Williams and Wilkins. pp. 177-148.
6. Azagidi AS, Ibitoye BO, Makinde ON, Idowu BM, Aderibigbe AS. Fetal gestational age determination using ultrasound placental thickness. J Med Ultrasound 2020;28:17-23.

7. Chauhan SP, Magann EF. Screening for foetal growth restriction. Clin Obstet Gynecol. 2006; 49:284–94. doi:10.1097/ 00003081-200606000-00010.
8. Shittu AS, Kuti O, Orji EO, Makinde NO, Ogunniy SO, Ayoola OO, et al. Clinical versus sonographic estimation of foetal weight in southwest Nigeria. J Health Popul Nutr. 2007;25:14–23.
9. Aye AA, Agida TE, Babalola AA, Isah AY, Adewole ND. Accuracy of ultrasound estimation of fetal weight at term: A comparison of shepard and hadlock methods. Ann Afr Med. 2022 Jan-Mar;21(1):49-53. doi: 10.4103/aam.aam_76_20. PMID: 35313405; PMCID: PMC9020636.
10. Ekele B, Otubu JA. Maternal and perinatal mortality. In: Agboola A, editor. Textbook of Obstetrics and Gynaecology for Medical Student. 2nd ed. Ibadan: Heinemann Educational Books; 2006. pp. 526–31.
11. Adhikari Ridhi, Pravin Kumar Deka, Ashok Tayal, Pramod Kumar Chettri. Ultrasonographic Evaluation of Placental Thickness in Normal Singleton Pregnancies for Estimation of Gestation Age. International Journal of Medical Imaging. Vol. 3, No. 6, 2015, pp. 143-7.
12. Suseela AV, Satyavani BC, Devi GR. Placental thickness and its ultrasonographic correlation with estimated fetal weight. International Archives of Integrated Medicine. 2020 Feb 1;7(2).
13. Smith NC, Smith APM. Obstetric and gynecological ultrasound made easy (2nd edn). Elsevier, London. 2006;123.
14. La Torre R, Nigro G, Mazzocco M, et al. Placental enlargement in women with primary maternal cytomegalovirus infection is associated with fetal and neonatal disease, Clin Infect Dis. 2006; 43(8):994-1000.
15. Ohagwu CC, Abu PO, Ezeokeke UO, et al. Relationship between placental thickness and growth parameters in normal Nigerian fetus. Afr J Biotechnol. 2009;8(2):133-8.
16. Ismail KI, Hannigan A, O'Donoghue K, Cotter A. Role of 2-Dimensional Ultrasound Imaging in Placental and Umbilical Cord Morphometry: Literature and Pictorial Review. J Ultrasound Med. 2019;38(12):3131-3140. doi: 10.1002/jum.15024.
17. Afrakhteh M, Moeini A, Taheri MS, et al. Correlation between placental thickness in the second and third trimester and fetal weight.Rev Bras Ginecol Obstet. 2013;35:317-22. DOI]
18. Noor N, Jain A, Parveen S, Ali SM. Ultrasonographic measurement of placental thickness and its correlation with estimated fetal weight. Int J Reprod Contracept Obstet Gynecol 2018;7:287-90.
19. Ismail KS, Abd Allah Mahgoub , A. Kunna , Hassan A Elkheir, Suad Elnour Mohamed , Umbeli Taha. Estimation of placenta thickness in third trimester to determine fetal weight in Sudanese women 2016. Res Rep Gynaecol Obstet. 2017;1(2):9-11.
20. Alka Patil, Sayli Thavare, Anand Tambat, Bhagyashree Badade. Ultrasonographic measurement of placental thickness in third trimester and its correlation with estimated fetal weight and birth weight. MedPulse International Journal of Gynaecology. October 2021; 20(1): 01-06. http:// medpulse.in/Gynacology/index.php
21. Gabr MA, Kamel HE, Elboghdady AA. Placental Thickness Measurement and Its Association with Neonatal Outcomes. International Journal of Medical Arts. 2022 Dec 1;4(12):2912-7.

22. Khajjayam A, Sharma J, Kumar A, et al. (June 20, 2024) Ultrasound Evaluation of Placental Thickness: Insights From an Observational Study and Implications for Fetal Growth Assessment. Cureus 16(6): e62760. DOI 10.7759/cureus.62760
23. Ashmawy N E I, Ahmed S. Saad, Ahmad S. Soliman, Mai H. Mohammed. Is there a correlation between Placental Thickness and Fetal Birth Weight? BMFJ 2020;37(3): 488-499 , DOI: 10.21608/bmfj.2019.17930.1089
24. Sandip Kumar Ghosh, *Sumanta Kumar Mandal, 1Kashi Nath Sarkar and Arijit Mishra. Evaluation Of Placental Thickness as A Sonological Indicator For Estimation Of Gestational Age and Fetal Outcome in Normal Singleton Pregnancy. wjpmr, 2019,5(3), 124-128.
25. Sersam, L. W., Abdul-Razzak, Z. Z. and Mohammed, S. Y. (2016): Second and Third Trimester Placental Thickness: Correlation with Placental and Birth Weights. Iraqi Academic Scientific Journal, 15(2): 185-193.
26. Karami Rasoul, Borji Soheila, Soltani Mohammad, Memari Behzad, Faghihzadeh Soghrat, Masoumkhani Fatemeh. Assessing the correlation of placental thickness with fetal weight in second and third trimester. JMSCR Vol||06||Issue||03||Page 720-726||March 2018. https://doi.org/10.1007/s13224-017-1038-8
27. Muraliswar Rao J, Anil Kumar Kallepally. Correlation of placental thickness in relation to gestational age and fetal weight by using ultrasonography. Int J Contemp Med Surg Radiol. 2019;4[3]:C135-C140. doi: 10. 21276/ijcmsr. 2019. 4.3.30.
28. Shinde G, Kshirsagar N, Laddad M et al. Ultrasonographic placental thickness versus fetal outcome: A prospective study in Southern India. Caspian Journal of Internal Medicine. 2021;12(4): 562–567. https://doi.org/10.22088/cjim.12.4.562
29. Abbood AA, Hameed RA, Mohammed-Najeeb AM. The correlation of placental thickness with gestational age and fetal weight by ultrasonographic examination in second and third trimesters of pregnancy. In Obstetrics and Gynaecology Forum 2024 Jun 19 (Vol. 34, No. 3s, pp. 1888-1894).
30. Jadoon RAM, Anwar J, Khattak AL, Khan MB, Azam MK, Afzal F. Correlation of Placental Thickness Measured Sonographically with the Gestational Age Estimated by Fetal Growth Parameters in Normal Singleton Pregnancy. Pak Armed Forces Med J 2022; 72(2): 341-344. DOI: https://doi.org/10.51253/pafmj.v72i2.6165
31. Vachon-Marceau C, Demers S, Markey S. First-trimester placen-tal thickness and the risk of preeclampsia or SGA. Placenta 2017; 57(2): 123-128.

Legend Tables and Graphs

Table 1: Distribution of the women according to Age

Age (Years)	Number	Percentage
<20	2	2
20 – 25	42	42
25 – 30	31	31
30 – 35	18	18
≥35	7	7
Mean Age ± SD	26.4 ± 4.76	

Table 2: Distribution of the women according to their Gravidity

Gravidity	Number	Percentage
G 1	50	50
G 2	28	28
≥3	22	22

Table 3: Mean Placental Thickness (cm) according to Gestational Age

Gestational Age (weeks)	No of women	Mean Placental Thickness (cm)
37 - 37^6	24	2.44 ± 0.35
38 - 38^6	30	3.03 ± 0.22
39 - 39^6	36	3.77 ± 0.54
40	10	4.31 ± 0.87

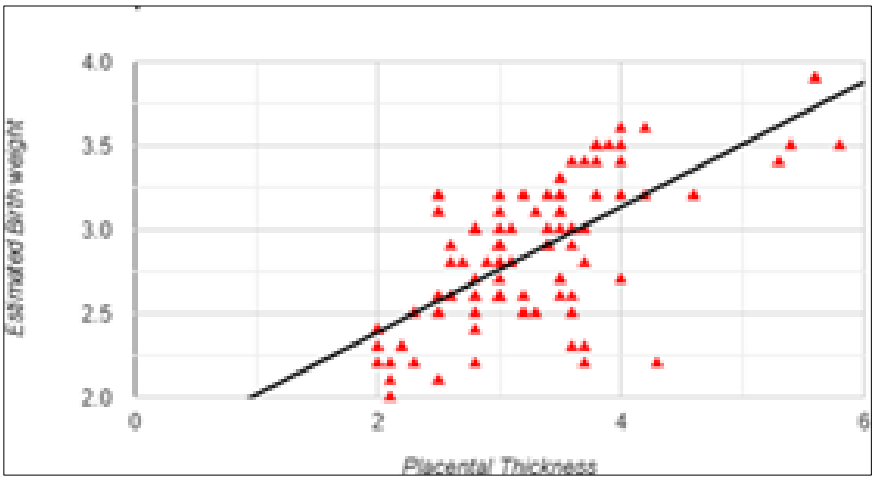
Table 4: Placental thickness and Estimated and Actual Birth Weight

Placental thickness	Estimated Birth Weight (Range)	Mean EBW	Actual birth weight Range	Mean Actual birth Weight
2 – 2.5	2.3-3.5	2.26±0.14	2 - 3.2	2.16±0.11
2.5 – 3.0	2.1-3.2	2.66±0.29	2 - 3.3	2.55±0.32
3.0 – 3.5	2.2-3.4	2.85±0.2	2.1 - 3.5	2.79±0.3
3.5 – 4.0	2.2-3.5	2.99±0.39	2.2 - 3.4	3.01±0.28
4.0 – 4.5	1.2-3.6	3.18±0.46	1.3 - 3.7	3.14±0.47
4.5 – 5.0	3.2	3.2	3	3
≥5	2.5-3.4	3.64±0.22	2.7 - 3.3	3.26±0.19

Table 5: Correlation of Placental thickness with estimated and actual birth weight

N = 100	Mean± SD	R	R square	P value
Placental Thickness	3.28 ± 0.78	0.688	0.473	<0.001
Estimated birth weight	2.86 ± 0.42			
Placental Thickness	3.28 ± 0.78	0.647	0.419	<0.001
Actual birth weight	2.79 ± 0.42			

Graph 1: Correlation of mean Placental thickness with EFBW



Graph 2: Relationship between Placental thickness and Actual birth weight