



## Original Article

## Sonographic Correlation of Placental Thickness with Estimated Fetal Weight at Term Among the Pregnant in Lahore

Abdur-Rehman Tuaha Mansoor<sup>1</sup>, Muhammad Uzair<sup>3</sup>, Annum Majeed<sup>2</sup>, Syed Muhammad Yousaf Farooq<sup>1</sup>, Mehreen Fatima<sup>1</sup>, Hamza Tariq<sup>1</sup>, Sarkhail Haider Khan<sup>1</sup>, Sidra Fatima<sup>1</sup>, Sana Irshad<sup>1</sup>, Rida Khalid<sup>1</sup> and Samavia Fiaz<sup>1</sup>

<sup>1</sup>University Institute of Radiological Sciences and Medical Imaging Technology, Faculty of allied Health Sciences, The University of Lahore, Lahore, Pakistan

<sup>2</sup>Rabia Clinic, Green Town, Lahore, Pakistan

<sup>3</sup>Gillani Ultrasound Clinic, Lahore, Pakistan

## ARTICLE INFO

## Key Words:

Ultrasonography, Placental Thickness, Estimated Fetal Weight

## How to Cite:

Mansoor, A.-R. T. ., Uzair, M. ., Majeed, A. ., Farooq, S. M. Y., Fatima, M. F., Tariq, H. ., Khan, S. H. ., Fatima, S., Irshad, S. ., Khalid, R. K., & Fiaz, S. . (2022). Sonographic Correlation of Placental thickness with Estimated fetal Weight at term among the Pregnants in Lahore. *Pakistan BioMedical Journal*, 5(1). <https://doi.org/10.54393/pbmj.v5i1.185>

## \*Corresponding Author:

University Institute of Radiological Sciences and Medical Imaging Technology, Faculty of allied Health Sciences, The University of Lahore, Lahore, Pakistan  
tahamansoor27@gmail.com

## ABSTRACT

Placenta develops in the uterus and provides oxygen and nutrients to the baby. It begins to form in the 2<sup>nd</sup> month of pregnancy and is usually matured in the 4<sup>th</sup> month. It can be seen through ultrasonography by 9<sup>th</sup> or 10<sup>th</sup> week. The normal functioning of the placenta is determined by measuring placental thickness through ultrasonography which increases with the gestational age and is considered normal when it does not exceed 4 cm at any time during pregnancy. **Objective:** To find Sonographic Correlation of Placental thickness with fetal weight at term among the pregnant in Lahore. **Method:** A total of 213 cases were included in this cross-sectional analytical study. All subjects were scanned at term and gestational age, estimated fetal weight and placental thickness were measured. Pearson's correlation was used to evaluate the correlation of placental thickness and estimated fetal weight. **Results:** Placental thickness and Estimated Fetal weight showed progressive increase in the value from 36 weeks to 40 weeks in this study. The mean placental thickness ranged from 30.15±5.12 mm at 36<sup>th</sup> week to 37.49±2.31 mm at 40<sup>th</sup> week. The mean estimated fetal weight ranged from 2885.00±194.18 grams at 36<sup>th</sup> week to 3919.85±352.88 grams at 40<sup>th</sup> week. A significantly moderate correlation has been found between estimated fetal weight and placental thickness measured after 36 weeks of pregnancy. **Conclusion:** It is concluded that placental thickness is directly related to estimated fetal weight after 36 weeks of pregnancy. Therefore, it is helpful to assess placental thickness for the proper evaluation of fetal growth and well-being.

## INTRODUCTION

Placenta is an organ which, during pregnancy, develops in the uterus and provides the developing baby with oxygen and nutrients [1], and eliminates waste products from the blood of the baby [2]. Placental formation begins in the later half of the 2<sup>nd</sup> month of the pregnancy and is usually completed by the 4<sup>th</sup> month [2] and becomes apparent on ultrasonography by 9<sup>th</sup> or 10<sup>th</sup> week [3-4]. The major characteristics of placenta are its provision of a physiological link between the mother and the fetus and its high perfusion that maintains fetus to maternal circulation of blood [5]. The normal functioning of the placenta is very much essential for the fetus to develop normally. Ailment in the placenta may result in serious complications,

especially on the health of the fetus and may ultimately result in death of the fetus and mother [6]. Placental thickness is one of the perimeters to check for the compatibility of the placenta along with the determination of fetal age as it gradually increases with the increase in fetal age [7], however, it is commonly considered that placenta thicker than 4 cm is abnormal and may become the source of poor fetal outcomes [8]. Abnormal fetal placental thickness may relate to small for date fetuses, preeclampsia in mothers, chromosomal abnormalities [9], fetal growth restriction [10], severe intrauterine infections, hydrops fetalis and diabetes mellitus [11-12]. Furthermore, it may associate with TORCH infections (toxoplasmosis,

other infections, rubella, cytomegalovirus, herpes simplex [10-12]. It may lead to perinatal risk with increased mortality and also increases the risk of small for gestational age and large for gestational age infants after 36 weeks [13]. Thick placenta with cysts is seen in partial molar pregnancy, triploidy and placental mesenchymal dysplasia [10]. With the increase in placental thickness, estimated fetal weight increases, hence, placental thickness has great significance in calculating estimated fetal weight with increase in gestational age[6]. Fetal weight is also a promising factor in estimating the age of fetus and assessing antenatal health and so, holds great significance while examining the fetus. There are certain parameters that calculate the estimated fetal weight through Ultrasonography which generally includes biparietal diameter (BPD), Head circumference (HC), Abdominal circumference (AC) and femur length (FL)[14]. It has been observed that estimated fetal weight of greater than 4000 grams is considered to be of serious concern [15]. EFW gradually increases with GA and usually until 1st trimester of pregnancy, it is measured using the Crown to Rump length (CRL) [16] but the calculations give an estimation which generally includes 15 percent of error [15], thus the term estimated fetal weight is used. Low fetal weights and excessive fetal weights are related to a high number of complications during pregnancy and even after, for the mother and the child. High perinatal morbidity and mortality is associated with low fetal weight and may result in preterm delivery and IUG. Similarly, high fetal weight may result in shoulder dystocia, brachial plexus injuries, bone injuries and intrapartum asphyxia during vaginal delivery as far as baby is concerned. In mothers, it may cause birth canal and pelvic floor injuries, increased rate of operative vaginal and caesarean deliveries and postpartum hemorrhage. Therefore, it is necessary to calculate the accurate fetal weight during pregnancy to prevent complications regarding SGA and LGA babies [14]. The commonest technique of measuring placental thickness is through placental-myometrial interface. Placenta is visible as a thickened echogenic rim of tissue which is surrounding the gestational sac. It is not before the 15th week of gestation, the placenta is well formed and the hypoechoic zone behind the placenta is easily identified. The normal placenta, on ultrasound, is discoid with rounded margins and uniform echogenicity and is usually on the posterior or anterior wall of the uterus and may also extend to the lateral walls of the uterus. The estimation of the placental thickness is purposely done to compare it with the fetal weight and age to check for the well-being of the fetus as it generally increases with gestational age. The Midportion of the placenta usually measures 2 to 4 cm and so is the average thickness of the normal placenta and the

appropriate site for the placental thickness measurement is the same[10], but precisely, where the umbilical cord inserts into the placenta especially when it is a case of central or near-central cord insertion, sonographic appearance of which is either it is hypoechoic areas proximal to the chorionic plate in the thickest part of placenta with a V shape or as perpendicular linear echoes emerging from the placental surface[6]. Another important consideration while measuring placental thickness is to figure out the placental position as anterior placentas are approximately 0.7 cm thinner than posterior or fundal placentas. Consequently, the anterior placenta measuring greater than 3.3 cm and posterior placenta greater than 4 cm is considered thickened [10]. Posterior placentas require acquisition of images with as less acoustic shadowing of the fetus as possible, while anterior placentas require proper transducer position and gain settings for minimization of the artifacts to identify the myometrial interface[17] The accuracy of the fetal weight estimation increases with increased formulas; however, the relation of placental thickness and fetal weight holds greater significance still as they have high positive correlation and this is useful to deduce results regarding the well-being of fetus and even neonates. Fetal weight, which is an important indicator of fetal growth and development, is commonly assessed during ultrasound obstetric scans. Placental thickness is promising and authentic parameter than most other formulas and measurements to estimate fetal weight and is not normally calculated in Pakistan, especially in Lahore. It is, therefore, necessary to provide complete attention towards technical details for the accurate measurement of placental thickness. Unfortunately, in Pakistan, this method of fetal weight estimation or the comparison between placental thickness and fetal weight is not generally considered, knowing that Pakistan is considered to have the third-highest rate of neonatal mortality in the whole world [18]. One of the studies shows that prematurity, perinatal asphyxia, and sepsis account for more than 90 percent of all newborn deaths in Pakistan [19]. Therefore, it is necessary for the sonologists or Radiologists to give proper consideration to fetal weight estimation by utilizing placental thickness.

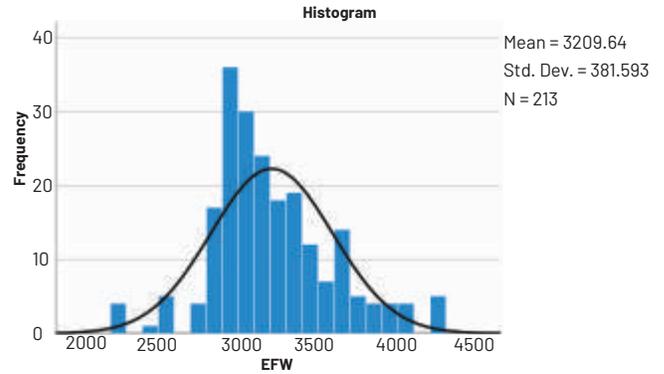
## METHODS

It was a cross-sectional analytical study. Total 213 cases were included over a period of 6 months from March 2021 to August 2021. This study was done in Rabia Clinic, Green town, Lahore and Gillani Ultrasound Clinic, Lahore. In both facilities, Toshiba Nemio 35 Ultrasound machine with 3.5 MHz probe was used. All women who underwent ultrasound scan were included on the basis of regular menstrual

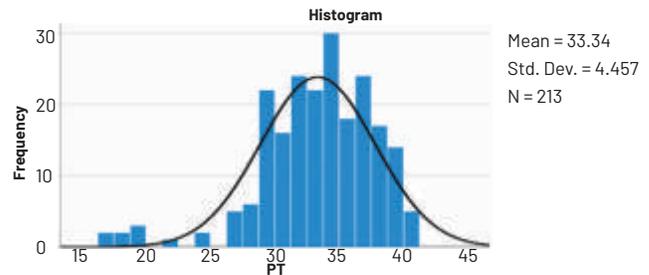
periods, singleton pregnancy and who were having a pregnancy of or more than 36 weeks. Patients who were known to have any kind of maternal or fetal pathology or twin pregnancies were excluded from the study. BPD, HC, AC and FL in millimeters were measured for the purpose of determining gestational age and estimated fetal weight. Placental thickness in millimeters was measured while the patient was in supine position, perpendicularly at the level of umbilical cord insertion. The means, ranges, maximum and minimum values, Pearson's Correlation was done using IBM SPSS statistics 28.0 version 2021.

**RESULTS**

In a total of 213 pregnant women, the scan done after 36 weeks of pregnancy shows mean placental thickness of 33.34 mm (Table 1) with a standard deviation of 4.457 (Table 1). The mean estimated fetal weight was 3209.64 grams with a standard deviation of 381.593 (Table 2, Figure 1). A significantly moderate correlation has been found between estimated fetal weight and placental thickness measured after 36 weeks of pregnancy (Table 3, Figure 2). Placental thickness was  $37.49 \pm 2.31$  at 40th week of gestation (Table 4).



**Figure 1:** Histogram showing Mean and standard deviation for estimated fetal weight



**Figure 2:** Histogram showing Mean and standard deviation for placental thickness

Discriptive Statistics			
	N	Mean	Std. Deviation
EFW	213	3209.64	381.593
PT	213	33.34	4.457
Valid N (listwise)	213		

**Table 1:** Descriptive statistics for estimated fetal weight and Placental thickness

Statistics			
N	Valid		213
	Missing		0
	GA (weeks)	EFW (g)	Placental thickness (mm)
Mean	37.41	3209.64	33.34
Std. Deviation	1.202	381.593	4.457
Range	4	2000	23
Minimum	36	2270	17
Maximum	40	4270	40

**Table 2:** Mean and standard deviation for estimated fetal weight and placental thickness

Correlations			
		EFW	PT
EFW(g)	Person	1	.451**
	correlation		<.001
	Sig (2-tailed)		
	N	213	213
Placental Thickness (mm)	Person	.451**	1
	correlation		
	Sig (2-tailed)	<.001	
	N	213	213

**Table 3:** Pearson correlation for estimated fetal weight and placental thickness

EGA (weeks)	No. of measurements	Placental thickness (mm)	EFW (g)
36	58	30.15 + 5.12	2885.00 + 194.18
37	75	33.29 + 3.87	3067.99 + 178.96
38	38	34.69 + 2.88	3361.24 + 174.59
39	27	36.22 + 1.96	3668.22 + 180.54
40	13	37.49 + 2.31	3919.85 + 352.88
41	2	36.00 + 3.67	4248.00 + 1.41

**Table 4:** Mean and standard deviation for estimated fetal weight and placental thickness at different gestational

**DISCUSSION**

Placenta develops in the uterus and provides oxygen and nutrients to the baby. It begins to form in the 2nd month of pregnancy and is usually matured in the 4th month. It can be seen through ultrasonography by 9th or 10th week. Placenta holds its significance due to its function as a physiological link between mother and fetus and, therefore, its normal functioning is very much essential for the healthy growth of the baby. Any ailment in placenta may lead to serious complications and even death of the fetus and mother. The normal functioning of the placenta is determined by measuring placental thickness through ultrasonography which increases with the gestational age and is considered normal when it does not exceed 4 cm at any time during pregnancy. Our study has included all the pregnant women within the normal range of placental thickness and the comparison with estimated fetal weight was done afterward. Placental thickness and Estimated Fetal weight showed a progressive increase in the value from 36 weeks to 40 weeks in this study. Our study showed

the range of mean placental thickness from 30.15±5.12 mm at 36th week to 37.49±2.31 mm at 40th week. In the case of Estimated Fetal weight, our study showed the range of mean estimated fetal weight from 2885.00±194.18 grams at 36th week to 3919.85±352.88 grams at 40th week. A positive linear relation was observed between placental thickness and estimated fetal weight. Therefore, it can be believed that placental thickness is a useful indicator of fetal growth. Similarly, Abu et al [20], also studied the Nigerian women in 2009 to correlate placental thickness and estimated fetal weight. They also found strong positive correlation between Placental thickness and estimated fetal weight in second and third trimesters of pregnancy. The mean placental thickness at 36th week came out as 39.30±7.11 mm and 43 mm±5.29 at 40th week. The mean estimated fetal weight at 36th week came out as 2761.73±192.62 grams and 3718.86±138.50 grams at 40th week. In his study, the maximum placental thickness they calculated was 45.10 mm and maximum EFW as 3719.47 grams. Our study showed the maximum placental thickness as 40 mm and the maximum EFW as 4270 grams. The relationship of placental thickness and estimated fetal weight in 2015[21]. They calculated the range of mean placental thickness from 40.9±7.2 mm at 36th week to 39.3±5.7 mm at 40th week. The estimated fetal weight ranged from 2710±275.2 grams at 36th week to 3304.8±284.6 grams at 40th week. This study showed significant linear pattern in the case of both estimated fetal weight and placental thickness similar to our study. It has been observed that over the years, mean placental thickness in general population shows a decline in measurement throughout after 36 weeks. Our study has shown that the mean placental thickness in population at 36th week was 30.15 mm and at 40th week, it was 37.49 mm, however older studies showed measurements reaching up to 40 mm at 36th week and up to 43 mm at 40th week. However, our study did not show any significant fall in the measurement of estimated fetal weight over the years. This study is based on the population of Pakistan and it has been discussed earlier that Pakistan has a third highest neonatal mortality rate. Therefore, it could be justified that placental thickness holds its significance truly well to study the well-being of the fetus. Scientist also predicts in his study that placental thickness has a significant role in evaluating estimated fetal weight and eventually the birth weight [22]. A study observed that placental measurements have vital impact on perinatal result. They presumed that placental assessment during ultrasonography is a fundamental instrument to evaluate the perinatal result [23]. A scientist studied placental significance in 2020 and deduced that placental measurements should be done during the ultrasonography

as they can provide important clues about the fetal health. The result of this study shows a significantly moderate correlation between placental thickness and estimated fetal weight. Along these lines, the placental thickness can be utilized as a reliable sign of ordinariness of fetal weight [24].

## CONCLUSION

This study has demonstrated a likely direct relationship between placental thickness and ultrasound Estimated Fetal Weight. It might in this way be feasible to anticipate deviations from standards of birth weight in late pregnancy from ultrasound assessed placental thickness. Furthermore, the gradual decline in the placental thickness over the years and increased neonatal mortality in Pakistan indicate a drawback of just estimating fetal growth and well-being through general ultrasonography parameters.

## REFERENCES

- [1] Suri S, Muttukrishna S, Jauniaux E. 2D-ultrasound and endocrinologic evaluation of placentation in early pregnancy and its relationship to fetal birthweight in normal pregnancies and pre-eclampsia. *Placenta*. 2013, doi: 10.1016/j.placenta.2013.05.003.
- [2] Mital P, Hooja N, Mehndiratta K. Placental thickness: a sonographic parameter for estimating gestational age of the fetus. *Indian journal of Radiology and Imaging*. 2002, 12(4):553.
- [3] Spirt BA, Gordon LP. Sonography of the placenta. In: Fleischer A.C, Manning FA, Jeanty P, Romero R. (eds). *Sonography in obstetrics and gynaecology: principles and practice*. 5th edition. Connecticut, USA: Appleton and Lange. 1996:173-2002.
- [4] Afrakhteh M, Moeini A, Taheri MS, Haghghatkhah HR. Correlation between placental thickness in the second and third trimester and fetal weight. *Revista brasileira de ginecologia e obstetricia*. 2013, 35(7):317-22. doi.org/10.1590/S0100-72032013000700006
- [5] Sadler TW. *Langman's medical embryology*. 9th edition. Baltimore, MD: Lippincott Williams and Wilkins. 2004:117-48.
- [6] Noor N, Jain A, Parveen S, Ali SM. Ultrasonographic measurement of placental thickness and its correlation with estimated fetal weight. *Int J Reproduct Contracept Obstet Gynecol*. 2018, 7:287-90. doi.org/10.18203/2320-1770.ijrcog20175863
- [7] Ahmed A, Alrashid Rahim HO, Elgyoum AA, Elzaki A. The correlation between placental thickness and fetal age among the pregnant in Sudan. *Scholars Journal of Applied Medical Sciences*. 2014, 2:395-8.

- [8] Hoddick WK, Mahony BS, Callen PW, Filly RA. Placental thickness. *J Ultrasound Med* 1985, 4(9):479-82. doi.org/10.7863/jum.1985.4.9.479
- [9] BaGhel P, Bahel V, Paramhans R, Sachdev P, Onkar S. Correlation of placental thickness estimated by ultrasonography with gestational age and fetal outcome. *Indian Journal of Neonatal Medicine and Research*. 2015, 3(3):19-24.
- [10] Fadl S, Moshiri M, Fligner CL, Katz DS, Dighe M. Placental imaging: normal appearance with review of pathologic findings. *Radiographics*. 2017, 37(3):979-98. doi.org/10.1148/rg.2017160155
- [11] Benrishke K, Kaufmann P. Anatomy and pathology of the umbilical cord and major foetal vessels. 2nd ed. New York: Springer-Verlag;. Chapter 29, pathology of human placenta. 1998, 319-77. doi.org/10.1007/978-1-4757-4196-4\_13
- [12] Lee AJ, Bethune M, Hiscock RJ. Placental thickness in the second trimester: a pilot study to determine the normal range. *Journal of Ultrasound in Medicine*. 2012 Feb; 31(2):2138. doi.org/10.7863/jum.2012.31.2.213
- [13] Balla EA, Ahmed MS, Ayad CE, Ahmed AS. Prediction of fetal growth by measuring the placental thickness using ultrasonography. *J Gynecol Obstet*. 2014, 2(2):26-31. doi.org/10.11648/jgo.20140202.14
- [14] Njoku C, Emechebe C, Odusolu P, Abeshi S, Chukwu C, Ekabua J. Determination of accuracy of fetal weight using ultrasound and clinical fetal weight estimations in Calabar South, South Nigeria. *International scholarly research notices*. 2014;2014. doi.org/10.1155/2014/970973
- [15] Westerway SC. Estimating fetal weight for best clinical outcome. *Australasian journal of ultrasound in medicine*. 2012, 15(1):13-7. doi.org/10.1002/j.2205-0140.2012.tb00136.x
- [16] Tongsong T, Boonyanurak P. Placental thickness in the first half of pregnancy. *Journal of Clinical Ultrasound*. 2004, 32(5):2314. doi.org/10.1002/jcu.20023
- [17] Kaushal L, Patil A, Kocherla K. Evaluation of placental thickness as a sonological indicator for estimation of gestational age of foetus in normal singleton pregnancy. *Int J Res Med Sci*. 2015, 3(5):1213-8. doi.org/10.5455/2320-6012.ijrms20150534
- [18] Nisar YB, Dibley MJ. Determinants of neonatal mortality in Pakistan: secondary analysis of Pakistan Demographic and Health Survey 2006-07. *BMC Public Health*. 2014, 14(1):1-2. doi.org/10.1186/1471-2458-14-663
- [19] Soofi SB, Ariff S, Khan GN, Habib A et al., Diagnostic accuracy of WHO verbal autopsy tool for ascertaining causes of neonatal deaths in the urban setting of Pakistan: a hospital-based prospective study. *BMC pediatrics*. 2015, 15(1):1-9. doi.org/10.1186/s12887-015-0450-4
- [20] Abu PO, Ohagwu CC, Eze JC, Ochie K. Correlation Between Placental Thickness And Estimated Fetal Weight In Nigerian Women. *Ibnosina Journal of Medicine & Biomedical Sciences*. 2009, 1(3). doi.org/10.4103/1947-489X.211063
- [21] Adeyekun AA, Ikubor JE. Relationship between two-dimensional ultrasound measurement of placental thickness and estimated fetal weight. *Sahel Medical Journal*. 2015, 18(1):4. doi.org/10.4103/1118-8561.152151
- [22] El-Kady MA, Mansour AM, Ismail MH. Can Placental Thickness predict Fetal Weight?. *QJM: An International Journal of Medicine*. 2020, 113 ( Supplement\_1 ): h c a a 0 5 6 - 0 1 2 . doi.org/10.1093/qjmed/hcaa056.012
- [23] Suseela AV, Satyavani BC, Devi GR. Placental thickness and its ultrasonographic correlation with estimated fetal weight.
- [24] Aydin E, Bulut AN. Evaluation of the relationship between placental thickness and obstetric doppler parameters during the second trimester.