Association Of Placental Thickness With Gestational Age And Fetal Well Being In Normal And Hypertensive Females Durind Second And Third Trimester

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Abstract

Background: Placenta promotes the flow of nutrients and waste products between the maternal and foetal circulatory system. Placental thickness has a strong connection to foetal development and have a significant role in the prenatal outcome.

Objectives: To determine the linear association of placental thickness with gestational age in normal and hypertensive females during second and third trimesters. To correlate the placental thickness with fetal outcome in normal and hypertensive females during second and third trimester pregnancy.

Methodology: It was a comparative analytical research; 196 expectant women were included. The gestation age ranged from 13 to 40 weeks. Using a Toshiba Xario XG ultrasound machine with convex probe of 3-5 MHz frequency, BPD, AC, HC, FL, and the PT were measured by USG. The inclusion criteria were normal pregnant females, (with no history of hypertension) and hypertensive pregnant females or with history of hypertension. The exclusion criteria were diabetic females, pregnancy with placenta percreta, increta, acreta, placenta abruption, placenta Previa, multiple pregnancy, and congenital abnormalities.

Results: A significant correlation is noted between placental thickness and gestational age with a p - value of 0.000 which is less than $\alpha = 0.001$. But the correlation of placental

thickness with hypertension was not found to be significant as p – value 0.788, that is > α = 0.001.

Conclusion: It is concludes that placental thickness increases with an increase in gestational age. We have not found any specific relationship between placental thickness and hypertension because any rise or fall in hypertension does not affect the measurement of placental thickness.

Key words: Gestational age, Placental thickness, Hypertension.

1. INTRODUCTION:

Placenta is very fascinating and complicated organ.(Burton & Jauniaux, 2015) It facilitates communication between the mother and the foetus. Even as it develops, this organ must perform its various functions, including secretion and transportation, thus all developmental changes must be consistent with this requirement.(Huppertz, 2008) One of the most significant temporary organs, placenta develops through the adhesion of maternal tissues and foetal membranes. (Hafez & science, 2017) At around 5 to 6 days, the blastocyst attaches to the receptive endometrial epithelium, beginning the process of human placentation.(Cindrova-Davies & Sferruzzi-Perri, 2022) Wide, low-resistance arteries are created as endovascular trophoblast cells invade and replace endothelium and smooth muscle cells, ensuring a steady flow of blood to the developing fetus.(Schiffer et al., 2021) The feto-placental unit is ensured to obtain the essential blood supply, as well as the effective transfer of nutrients and gases, as well as the elimination of wastes, through trophoblast cell invasion of uterine tissues and remodelling of uterine spiral artery walls.(Gude, Roberts, Kalionis, & King, 2004)

Placental thickness has a strong connection to foetal development and have a significant role in the prenatal outcome, at term the placenta is 15-25cm in diameter and around 3cm thick (Fig.1.1) (BaGhel et al., 2015)

Fig. Fundo posterior hypoechoic placenta measuring 26.7mm thickness at 26 weeks in normotensive female.

So, prenatal nutritional condition and foetal outcome must be reflected in placental measurements like placental thickness. The easiest way to determine placental size is to assess placental thickness. From being highest in the centre to being lowest in the perimeter, it varies. Perpendicular measurements of placental thickness should be conducted at the level of the umbilical cord.(Nagpal, Mittal, Grover, & India, 2018)

The placenta is well developed and simple to see on transabdominal ultrasonography by 14–15 weeks. A hypoechoic subplacental venous complex should be seen between the placenta and the myometrium, giving the placenta a generally homogenous appearance on ultrasound. Placental thickness, measured in millimetres, increases with increasing gestational age.(Bowman & Kennedy, 2014) The examination of the placenta during pregnancy has traditionally been done using conventional two-dimensional (2D) ultrasonography. The placenta's morphology, anatomy, position, implantation, abnormality, size, color/power assessment, and pulsed Doppler ultrasound assessment are all included in this 2D ultrasound study. (Hata, Tanaka, Noguchi, & Hata, 2011)

Maternal health and foetal development are both directly related to the pathophysiology of the placenta. It is essential to provide individuals with preeclamptic conditions, or pregnancy-induced hypertension (PIH), with the right care in order to prevent a fatal disaster. After 20 weeks of pregnancy, PIH is characterized by blood pressure increase, which is frequently accompanied with proteinuria. To comprehend the pathophysiology of this illness, several backgrounds including genetic, immunologic, metabolic susceptibilities, and others,

have been looked into.(Furuya, Ishida, Aoki, Fukamizu, & management, 2008) One of the main factors contributing to perinatal mortality and morbidity is intrauterine growth restriction (IUGR). Impaired placentation is assumed to be the main cause of the majority of instances of severe IUGR, even though maternal cigarette use, infections, and genetic diseases are known to cause IUGR in certain situations. (Veerbeek et al., 2014)

However, pregnancy outcomes are also affected by the placenta's size and development pattern.

This study was designed to identify the importance of placental thickness as an additional sonographic approach to determine any fetal outcome and to analyse the association between placental thickness and gestational age in hypertension and normotensive pregnancies.

2. MATERIAL AND METHOD:

It was a cross sectional analytical study which was done on one hundred and ninety-six patients, in which half were hypertensive and other half were normal pregnant females. This research was done at university ultrasound clinic, Green town, Lahore with Toshiba Xario XG, with convex probe frequency ranges 3MHZ-5MHZ. Convenient sampling technique was used. The duration of study was 7 months. The inclusion criteria were normal pregnant females, (with no history of hypertension, all gestational ages and all maternal ages). Hypertensive pregnant females, with history of hypertension. The exclusion criteria were diabetic females, pregnancy with placenta percreta, increta, acreta, placenta abruption, placenta Previa, multiple pregnancy and congenital abnormalities. All pregnant females of 2nd and 3rd trimester with and without hypertension were included in this study. Data collection was performed with normal and hypertensive females and placental thickness was measured and noted accordingly. The placental thickness was measured at the point where umbilical cord was inserted. A transabdominal scanner (3.5MHZ). The biparietal diameter (BPD), abdomen circumference (AC), crown rump length (CRL), head circumference (HC), and femur length (FL) were all measured in order to estimate the gestational age. An informed consent was obtained from subject before starting the study. The patient was asked to lie in supine position. The patient was asked to empty her bladder before examination. Convex probe was used for examination. Blood pressure was recorded by

using sphygmomanometer. LMP was asked and gestational age was calculated. Routine obstetrical examination was performed. The statistical analysis was performed using SPSS version 25.0. Qualitative variables as; hypertension and fetal outcome was described as frequency. Quantitative variables as; maternal age, gestational age, and placental thickness was described as mean and range. Correlation was assessed by using pearson's correlation test and value of r was calculated. p - value < 0.001 was considered as significant.

3. RESULTS:

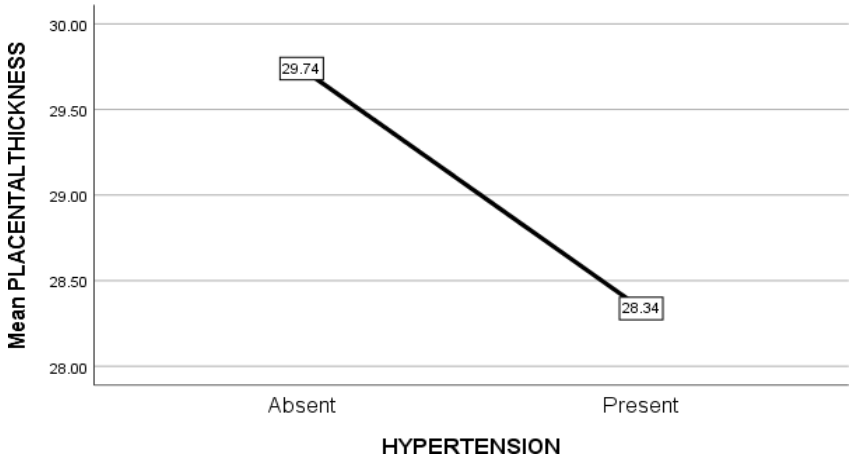
Total 196 expected ladies were included in this study with the gestational age range between 13 to 40 weeks. The Pearson's correlation between placental thickness and gestational age was found to be significant with the p - value (<0.001). Univariant analysis of variance was applied to all subjects. Hypertension was found to be insignificant with placental thickness as p – value 0.788, that is > α = 0.001. While placental thickness was changing with gestational age with a p - value of .000 which is less than α = 0.001. Placental thickness with respect to gestational age in the second trimester (12-13 weeks) in which the mean thickness was found to be 16.30 mm in total 3 patients, with std. deviation ±5.112, with maximum value 22mm and minimum value 11mm respectively. From total sample size of 196 in this table (1.1) and Graph (1.1), compare means of placental thickness with respective gestational ages from (13-38 weeks), second and third trimester have mean value of 29.26 with std. deviation ±8.527 (max. 59mm and min.11mm). The result of independent t-test was showing statistically insignificant, difference of mean of placental thickness in hypertensive and noromotensive feamles. It means that hypertension does not affect the placental thickness.

Table 1: Comparison of mean of placental thickness in normal and hypertensive females

INCREASE PLACENTALTHICKNESS

HYPERTENSION	Mean	N	Std. Deviation
Absent	29.7388	129	8.24213
Present	28.3373	66	9.11295
Total	29.2644	195	8.54917

Graph 1: Mean placental thickness of normotensive and hypertensive patients



Mean placental thickness of normotensive and hypertensive patients in which the mean placental thickness in hypertensive females was 28.34, as compared to hypertensive females the normotensive females had mean placental thickness 29.74 as shown in the simple line graph.

Independent Samples Test					
	Mean Difference	Std. Error Difference	t	df	Sig. (2-tailed)
Equal variances assumed	1.402	1.293	1.084	193.000	.280
Equal variances not assumed	1.402	1.336	1.049	120.109	.296
Hartley test for equal variance: F = 1.222, Sig. = 0.1664					

4. DISSCUSION:

In a research performed by BaGhel P, Bahel V it is stated that the mean placental thickness at 24 weeks (24.5mm), 32 weeks (31.8mm) and 36 (35.5mm) weeks respectively, placental thickness in mm almost exactly matches gestational age in weeks. It implies a significant positive connection between biometric measurements (taken at 24, 32, and 36 weeks) and placental thickness. Thus, the research demonstrated that IUGR and a significantly high percentage of new born with low birth weight were connected with placental thickness below the 10th percentile. The average placental thickness in their

research was 35.5mm at 36 weeks. In this case, IUGR could be identified with a sensitivity of 53.5%, specificity of 92%, and positive predictive value of 80% when placental thickness was below the 10th percentile at 32 and 36 weeks. This demonstrates that placental thickness is a highly effective measure in IUGR prediction. (BaGhel et al., 2015) According to our study we found a significant correlation is between placental thickness and gestational age with a p - value of 0.000 which is less than $\alpha = 0.001$. But the correlation of placental thickness with hypertension was not found to be significant as p – value 0.788, that is $> \alpha = 0.001$. Also we noted in our study that if the negative outcome of foetus has already found, it will no further effect the placental thickness. As the negative outcome of foetus may depend on various other factors.

A similar study by T. Karthikeyan et.al. Further conveys that the placental thickness is a gestational age dependent characteristic and that it increases with gestational age. There was an increase in placental thickness with gestational age in the first trimester (12-13weeks), second trimester (14-26weeks), and third trimester (27-40weeks) of test sample sizes 32 in first trimester, 89 in second, and 90 respectively, this study explain that decreased placental thickness is associated with IUGR that can be cured if it is diagnosed earliest. Placentomegaly is associated if placental thickness is >40mmn and it is related to gestational diabetes mellitus and increase placental thickness for that gestational age should raise a suspicion about possible disease condition. Placental thickness is directly related with gestational age. In his study he declared that placental thickness is used as reliable indicator of gestational age. (Karthikeyan, Subramaniam, Johnson, & Prabhu, 2012) In our research with the sample size of 196 we also noted that the total compare means of placental thickness with respective gestational ages from (13 to 38 weeks) were found to be 29.2644mm. According to our study, a significant correlation is noted between placental thickness and gestational age with a p - value of 0.000 which is less than $\alpha = 0.001$.

According to habib et.al. (2002), a placental thickness of less than 2cm at 36 weeks gestation may serve as a very sensitive cut-off point for LBW neonatal detection. Due to the patient's inadequate participation, repeated fetal and placental measurements were not carried out in this study, which was its principle flaw. According to the study, fetal growth retardation comes before placental growth retardation. According to their

study, the placental thickness at 36 weeks was 34.8mm in the hatchlings that weighed more than 2500g and 22mm in the newborns that weighed less than 2500g. They believed that placental thickness was a sign of low birth weight (LBW) babies. (Habib, 2002) In our research with the sample size of 196 we took both normotensive and hypertensive pregnant females during second and third trimester. The total compare means of placental thickness with respective gestational ages from (13 to 38 weeks) was found to be 29.2644mm with std. deviation ±8.54917. According to our study, a significant correlation is noted between placental thickness and gestational age with a p - value of 0.000 which is less than $\alpha = 0.001$. But the correlation of placental thickness with hypertension was not found to be significant as p – value 0.788, that is $> \alpha = 0.001$.

The research was based on the correlation between placental thickness and gestational age in hypertensive and normotensive pregnancies and to identify the importance of placental thickness to determine any fetal outcome. In our study total compare mean of placental thickness with respective gestational age from 13-38 weeks is found to be 29.26 mm in normotensive patients, the total mean of placental thickness in hypertensive patients of second and third trimester were found to be 28.33. So, according to this study in normotensive and hypertensive pregnancies the placental thickness and gestational age are positively correlated with each other, by increasing gestational age, placental thickness also increases. But the placental thickness does not found as affective or correlate with hypertension. Placental thickness does not change with the upsurge in the gestational age. In our study we also noted that if the negative outcome of foetus have already found, it will no further effect the placental thickness. As the negative outcome of foetus may depends on various other factors.

5. CONCLUSION:

Study concludes that placental thickness increases with an increase in gestational age. We have not found any specific relationship between placental thickness and hypertension because any rise- fall in hypertension does not affect the measurement of placental thickness. We also noted that any negative fetal outcome does not affect the measurement of placental thickness in any case.

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