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Correlation between Placental Thickness and Estimated Fetal Weight in Women with Hypertension in Third Trimester: A Case Control Study

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ABSTRACT

Pregnancy-induced hypertension (PIH) as a rapid consequence of gestation consists of gestational hypertension. In this study, we decided to inspect the association between the placental thickness and the fetal load in women with hypertension. This is a case control observational investigation that was led on 179 pregnant ladies in their third trimester (47 hypertensive pregnant women and 132 straightforward pregnancies). Ultrasound was accomplished for estimating the placental thickness (PT), bi-halfway measurement (BPD), head perimeter (HC), femur length (FL), stomach boundary (AC), and assessed fetal weight. As a result, it was found that there was critical positive relationship between placental thickness and assessed fetal load in charge bunch ($r=0.2$, $P<0.05$), while there was immaterial negative connection between placental thickness and assessed fetal load in quiet gathering ($r=0.03$, $P>0.05$). Straight relationship of the assessed fetal load is illustrated with placental and maternal elements in third trimester in the two patients and control bunch. The most prominent and critical viable calculate the impact on estimated fetal weight (EFW) control bunch that were placental thickness and graduate (chances proportion =1.812883, 1.548056, $P<0.05$) individually, where as the best and huge compelling element impact on EFW in understanding gathering was just placental graduate (chances proportion =1.61931, $P<0.05$). Therefore, placental thickness can be utilized as a promising boundary in anticipating expected fetal birth weight (EFBW) with other fetal boundaries during antenatal development in women with straightforward pregnancies; however, it might not be able to utilize it in muddled pregnancy.

GRAPHICAL ABSTRACT

Correlation Between Placental Thickness and Estimated Fetal Weight in Women with Hypertension in Third Trimester

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Introduction

Pregnancy-induced hypertension (PIH) as a rapid consequence of gestation. It consists of gestational hypertension; define as systolic blood pressure ≥140 mmHg and diastolic heartbeat ≥90 mmHg in a pregnant woman of gestational age ≥20 weeks, and proteinuria ≥300 mg/24 h or ≥30 mg/mmol or ≥2+ on the test strip [1,2]. The placenta is a significantly vascular organ. Its critical limit is to give the crucial relationship between the mother and the making fetus [3–5]. The placenta makes from the villi at the implantation site for around five weeks advancement and by 9-10 weeks hatching, the diffuse granular resonation surface of the placenta is indisputably clear at ultrasound [6]. At term, the placenta is generally 3 cm thick and measures 15 to 25 cm in diameter [7]. Placental thickness is immovably related to fetal success and may be a basic factor in perinatal outcome. Clearly common headway of placenta during improvement is key for supporting of a child. On the other hand, any weakness in its improvement may fundamentally influence fetal new development and pregnancy outcome [8]. The placenta keeps up the feto-maternal course through an affiliation (the umbilical line) [9,10]. Since its ability is to supply oxygen and sustenance for the beginning life form, the genuine turn of events and weight of the incipient organism at the birth depend upon the plentifulness of the placenta and its ability [11]. Placental thickness (PT) increases with fetal age and a run of the mill creating placenta to the extent plan and limit produces normal turn of events and progression of the baby [12]. Regardless, in PIH, there is impedance in the placenta improvement, which along these lines antagonistically influences the PT and, in the same manner, the fetal turn of events and pregnancy results. The consequence of uncontrolled PIH is from the get go, the diminishing of the placental size and its thickness under the steady predictable value [13,14]. Ultrasonography (US) occupies the assessment of the placental thickness and capacity or exact methodology like three-dimensional Doppler [15,16]. If the fetal advancement is sabotaged as a result of surprising working of the placenta, this can be distinguished by the exceptional placental assessments. Therefore, it has all the earmarks of being reasonable that evaluation of placental thickness help to choose conventional new development and valuable of the placenta and can go probably as a fair marker of fetal turn of events and birth weight [17–19]. Placental appraisal has been used to depict placental position and morphologic changes as the placenta creates. The assessment of placental thickness is by and large clear, clinically supportive, and considered as the easiest placental estimation to measure [20]. Appraisal of fetal weight is basic in step-by-step obstetric practice, especially at the third trimester. It guides obstetricians to make up their decisions concerning time and strategy for movement to get ready for hardships of low birth weight and macrosomic babies during work and puerperium [21]. A recent study suggests that maternal hypertension genes are strongly associated with placental growth and that fetal growth inhibition is induced through the intrauterine environment established by the placenta [22]. Another research reached to the conclusion that placental thickness should be measured in addition to biometric parameters in antenatal women undergoing ultrasound [23]. The purpose of this study is to assess the relationship between placental thickness in hypertensive pregnant women (as assessed with trans-abdomen ultrasound) and the fetal weight.

Material and Methods

This is a case control study that was directed in the Obstetrics and Gynecology and the Ultrasound Private Center in Babylon territory. 132 simple pregnant women matured between 18 to 38 years of age and 47 pregnant ladies with hypertension were associated with this examination. The investigation was directed from February 2020 to April 2021. All patients gave an educated composed assent after they were perfectly taught about the examination. The investigation was supported by Institutional Ethics Committee. The patient's personal information will be held with high privacy. The data that will be acquired will be used for clinical management and patient's academic purposes only. The examination requested by the primary physician is the only examination that will be done. Written informed

consent will be acquired from all patients enrolled in the study. Females with age extent of 18 to 38 years old, normal singleton pregnancy were associated with this examination. Included women were suggested from obstetric office and each one presented to: history taking, genuine evaluation includes circulatory strain and the ultrasound for the examination of gestational age≥20 weeks, proportion of fetal wight and show, fetal heart sounds, placental assessment, position, and thickness. Antenatal mothers with no co-morbidity affecting pregnancy. Patients with written informed consent. Those who did not meet the inclusion criteria were excluded. Placental thickness was gotten by using 4D test (CV1 8AD) 1-8 MHz of Samsung HS50 model 2020. Placental thickness was assessed in cm and dictated by averaging the three best assessments for each case at sit of line inclusion (see Figure 1). Placental thickness was gotten by ultrasonography and related with fetal limits like femur length (FL), biparietal measurement (BPD), head outline (HC), and the stomach circuit (AC) was utilized to foresee assessed fetal birth weight (EFBW) as per Hadlock recipe as essential outcome [24,25]. The collected data was broken down by (SPSS) form 23 for the connection between placental thickness and different boundaries. P-value <0.05 was considered genuinely huge. T-test was utilized for nonstop information, while chi tests for discrete information. Pearson's connection investigation was utilized to build up the connection between placental thickness and assessed fetal weight.

Figure 1: Ultrasound measurement of posterior placental thickness at cord insertion site

Results

Total of 179 women were included in the study (47 patients with hypertension and 132 apparently healthy women). Regarding the age, gestational age, parity, and history of abortion, there were insignificant difference between patient and control group (P>0.05). Most patient are multigravida 78.7% and half of them multipara. There was significant difference between patient and control group regarding gravidity (P<0.05), as indicated in Table 1.

The mean placental thickness (Mean±SD) in the studied group was shown in Table 2. There was a significant difference between patient and control group at 30-32 weeks (p<0.05), while there was an insignificant difference in placental thickness between patient and control group at other gestational age (p>0.05).

The mean estimated fetal weight (Mean±SD) in the studied group was indicated in Table 3. There was an insignificant difference in estimated fetal weight between patient and control group at different gestational age (p>0.05).

Table 1: Distribution of the studied group according to age, gestational age, gravidity, and parity

Characteristics		Patient	Control	P-value
Age (years)		28.68±6.47	26.71±6.32	0.07
Gravidity	1	10 (21.3%)	46(34.8%)	0.014**
	1-4	22(46.8%)	68(51.5%)	
	>5	15 (31.9%)	18 (13.6%)	
Parity	null	15(31.9%)	58 (43.9%)	0.199
	1	8(17.0%)	30(22.7%)	
	1-4	20(42.6%)	36(27.3%)	
	>5	4(8.5%)	8(6.1%)	
Abortion	no	29(61.7%)	99(75.0%)	0.058
	1	9 (19.1%)	24 (18.2%)	
	1-4	9 (19.1%)	8 (6.1%)	
	>5	0(0.0%)	1(0.8%))	
Gestational age (weeks)		35.04±3.02	35.10±2.81	0.9
28-30		4 (8.5%)	5(3.8%)	0.852
30-32		4 (8.5%)	12 (9.1%)	
32-34		8 (7.0%)	27 (20.5%)	
34-36		12 (25.5%)	36 (27.3%)	
36-38		12 (25.5%)	30 (22.7%)	
38-40		7 (14.9%)	22 (16.7%)	
Total		47 (100.0%)	132 (100.0%)	

**P-value <0.05 was significant*

Table 2: Distribution of mean placental thickness at different gestational ages

Gestational age (weeks)	Placental Thickness (Cm)		P value
	Patient	Control	
28-30	4.03±0.65	3.51±0.46	0.128
30-32	3.03±0.37	3.66±0.49	0.036*
32-34	4.06±0.70	3.80±0.75	0.338
34-36	4.11±0.60	4.00±0.61	0.576
36-38	3.82±0.55	3.62±0.63	0.349
38-40	3.80±0. .69	4.05±0.74	0.436
Total	3.88±0.65	3.80±0.68	0.60

**P value <0.05 was significant*

Table 3: Distribution of estimated fetal weight at different gestational ages

Gestational age (weeks)	Estimated fetal weight (gm)		P-value
	Patient	Control	
28-30	1621.25±279.87	1347.00±140.68	0.095
30-32	1688.250±228.10	1657.08±143.38	0.794
32-34	2135.750±239.25	2220.96±210.85	0.337
34-36	2601.167±252.63	2712.472±297.136	0.251
36-38	3177.583±184.99	3052.90±231.68	0.105
38-40	3298.714±343.77	3420.09±211.41	0.267
Total	2611.915±640.55	2659.57±620.15	0.654

**P-value <0.05 was significant*

The correlation between placental thickness and fetal weight was displayed in Figure 2. There was a significant positive correlation between placental thickness and estimated fetal weight in control group (r=0.2, P<0.05) while there was an insignificant negative correlation between placental thickness and estimated fetal weight in patient group (r=0.03, P>0.05).

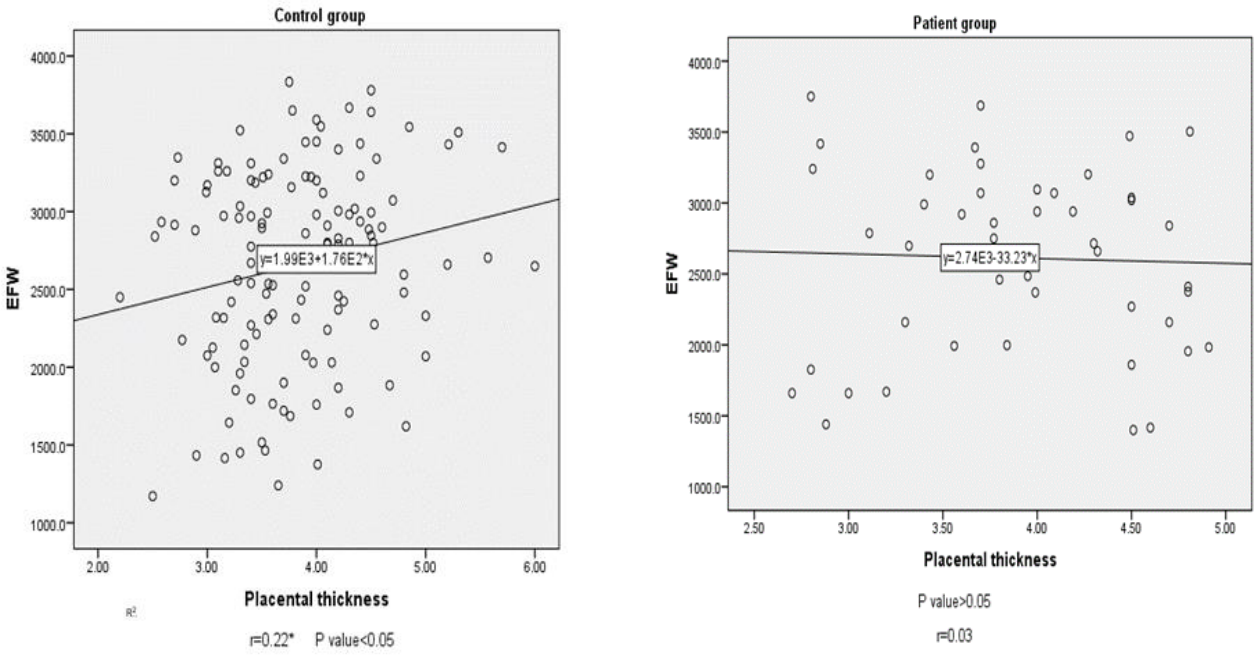

Figure 2: The correlation between placental thickness and estimated fetal weight in studied groups

The correlation between placental thickness and fetal parameters in studied groups are depicted in Table 4. There was a significant positive correlation between placental thickness and FL, BPD, and AC in control group (P<0.05), while there was an insignificant positive correlation between placental thickness and FL, BPD, and AC in patient group (P>0.05).

Table 4: The correlation between placental thickness and fetal parameters (FL, BPD, and AC) in studied groups

Fetal parameters		Placental thickness	
		Control	Patients
FL	Pearson Correlation	.214*	.047
	Sig. (2-tailed)	.014	.752
	N	132	47
BPD	Pearson Correlation	.234*	.038
	Sig. (2-tailed)	.025	.802
	N	132	47
AC	Pearson Correlation	.212*	.025
	Sig. (2-tailed)	.015	.868
	N	132	47

**P-value <0.05 was significant*

Linear relationship of the estimated fetal weight with placental and maternal factors in the third trimester in both patients and control group are represented in Table 5. The greatest and significant effective factor effect on EFW in control group were placental thickness and grad (odds ratio =1.812883, 1.548056, P<0.05), respectively whereas the greatest and significant effective factor effect on EFW in patient group was placental grad only (odds ratio=1.61931, P<0.05).

Table 5: Linear relationship of estimated fetal weight with placental and maternal factors in the third trimester in both patients and control group

Control group		Odds ratio	95.0% Confidence Interval for B		P-value
Placental characteristics	Placental site	1.084371	-67.652	187.190	0.355
	grade	1.548056	169.859	358.378	0.001*
	Thickness	1.812883	21.092	330.247	0.026*
Maternal Characteristics	age	0.857272	-38.284	8.008	0.198
	G	0.539021	-751.346	358.349	0.485
	P	1.571905	-295.963	795.346	0.367
	A	1.124119	-478.849	666.308	0.747
Patient group					
Placental characteristics	Placental site	1.099659	-160.169	309.023	0.526
	Grade	1.61931	148.685	506.558	0.001*
	Thickness	0.966572	-328.155	261.688	0.821
Maternal Characteristics	Age	0.718205	-67.884	2.353	0.067
	G	0.932004	-1754.258	944.020	0.548
	P	1.054065	-873.068	1851.569	0.473
	A	1.148383	-961.552	1847.119	0.528

*Dependent Variable: EFW, *P-value <0.05 was significant*

Discussion

Our results show that there was a significant positive correlation between placental thickness and estimated fetal weight in control group (r=0.2, P<0.05), while there was an insignificant negative correlation between placental thickness and estimated fetal weight in patient group (r=0.03, P>0.05), which matches with the study conducted by [26]. It was found a significant correlation between the placental thickness with fetal weight at third trimester (r=0.541, p=0.005). The relationship between placental thickness and fetal boundaries in the collected data are displayed in Table 4. There was a huge positive connection between placental thickness and FL, BPD, and AC in control bunch (P<0.05), while there was irrelevant positive relationship between placental thickness and FL, BPD, and AC in quiet gathering (P>0.05). In addition, [27] directed an examination indicating that there was a straight connection between placental thickness, normal gestational age (R2=0.9593), and development boundaries including biparietal width (BPD) and femur length (FL). It was showed that there was a gigantic positive relationship amongst PT and BPD, AC, FL, ABC, HC, and EFBW [28]. They saw that odd PT may be an earliest pointer of IUGR, which can be managed if it was dissected early. In an examination an immediate augmentation of placental width was shared with gestational age over gestation. They raised thickness level of the placenta in birth weight term more than 4,000 g or under 2,500 g. In any case, no any difference between thick placenta in patients and control bundle similar to diabetes and hypertension. The makers requested that extended placental thickness is not definite of a specific issue, yet it may add to the organization of a baby in peril [29]. Direct relationship of the assessed fetal load with placental and maternal variables in third trimester in the two patients and control bunch are displayed in Table 5. The most prominent and huge viable considered the impact on EFW control bunch were placental thickness and graduate (chances proportion =1.812883, 1.548056, P<0.05) individually where as the best and huge successful calculate impact on EFW patient gathering was placental graduate just (chances proportion =1.61931, P<0.05). This outcome of our assessment is consistent with various examinations. Furthermore in the assessment [26,30,31], there was a basic positive association between the placenta thickness and the fetal age, anyway in the Pale V assessment, it was revealed that there is no association between the thickness of the placenta and the age of the child over 32 weeks of gestational age, which renounces our examination results and various examinations. In [32], this associate on was further inspected in the third trimester, which showed a basic association between the placental thickness and the fetal age

ultrasound measures (BPD, FL, and AC), and they saw that the placental thickness is an aide limit in the appraisal of the gestational age in the third trimester, which is similarly contrary to the results of the Pale V assessment. In another assessment, experts suggested that sonographic expansion of placental thickness during second trimester is relied upon to over-enlarging of the intervillous space by maternal blood rather than by versatile arrangement of practical placental tissue [33,34]. Therefore, many examinations inferred that the placental thickness can be utilized to appraise the fetal weight [35,36].

Conclusion

Placental thickness can be utilized as a promising boundary in anticipating expected fetal birth weight (EFBW) with other fetal boundaries during antenatal development in women with straightforward pregnancies. However, it might not be able to be utilized in muddled pregnancy. The results of this study reveal a strong positive correlation between placental thickness and estimated fetal weight. Thus, placental thickness can be used as a fairly accurate indicator of normality of fetal weight, but because of wide variations in placental thickness corresponding to particular fetal weight a more thorough search should be undertaken when a fetus is considered to be at risk.

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Authors' contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

Conflict of Interest

There are no conflicts of interest in this study.

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