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ORIGINAL RESEARCH

Placental thickness in first trimester as predictor of pre-eclampsia and SGA

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ABSTRACT

Background: The placenta in humans develops primarily to supply nutrients and oxygen to the fetus. The effective transfer of nutrients from the mother to the fetus through a properly functioning utero-placental organ is crucial for adequate fetal growth and the resultant normal birth weight. The present study was conducted to assess first trimester placental thickness for prediction preeclampsia or small gestational age.**Materials & Methods:**78 singleton pregnancy, gestational age from 11 to 14 weeks and reliable last menstrual period were selected. Fetal biometry (BPD, FL, AC), estimated fetal body weight, amniotic fluid index (AFI), blood pressure, lower limb edema and biochemical analysis for proteinuria, mode of delivery, and APGAR score at one minute and five minutes from the time of birth was recorded.**Results:**Parity was primigravida in 32, multigravida in 24 and grand multigravida in 22. Residence was rural in 40 and urban in 38. Education was illiterate in 30 and high and above in 48 cases. The difference was non- significant (P> 0.05). Placental thickness (mm) found to be 0.9 and 0.7, uterine artery index (UAI) was 0.5 and 1.2, umbilical artery index at 2nd trimester was 0.6 and 0.9, umbilical artery index at 3rd trimester was 0.7 and 0.8, post- delivery fetal weight (kg) was 3.2 and 2.7 and post- delivery placental weight (kg) was 0.51 and 0.42 in patients without PE and patients with PE respectively. The difference was significant (P< 0.05). Placental thickness (mm) was 1.05 and 0.8, uterine artery index (UAI) was 0.7 and 1.6, umbilical artery index at 2nd trimester was 0.6 and 1.8, umbilical artery index at 3rd trimester was 0.7 and 1.9, post- delivery fetal weight (kg) was 3.2 and 2.3 and post- delivery placental weight (kg) was 0.53 and 0.46 in patients without SGA and with SGA respectively. The difference was significant (P< 0.05).**Conclusion:** There exists a strong correlation between placental thickness and the development of small gestational age and preeclamptic toxemia; however, incorporating different Doppler indices would enhance the predictive value of maximal placental thickness for small-for-gestational.

Keywords: fetal weight, preeclampsia, placenta

INTRODUCTION

The placenta in humans develops primarily to supply nutrients and oxygen to the fetus. The effective transfer of nutrients from the mother to the fetus through a properly functioning utero-placental organ is crucial for adequate fetal growth and the resultant normal birth weight.[1] For a fetus to be healthy, it is evident that the placenta must develop normally throughout pregnancy. Conversely, any hindrance to its development could significantly affect fetal development and the outcome of the pregnancy.[2] Preeclampsia and fetal growth restriction (FGR) are two obstetric complications that are often linked to both gross and histopathologic abnormalities of the placenta. Identifying intrauterine growth restriction (IUGR) at an early stage will aid obstetric and neonatal care.[3]It is crucial to estimate fetal weight, as a significant share of perinatal mortality is linked to birth weight. Consequently, the most crucial factor for determining neonatal survival is birth weight.

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Obstetric ultrasound provides the means to evaluate placental dimensions and estimate fetal weight.[4]

The measurement of placental thickness via 2D ultrasound in the first trimester is straightforward, and 2D placental measurements have shown potential usefulness in predicting adverse outcomes in specific high-risk patients.[5] At the 11–14 weeks' ultrasound, a straightforward measurement of maximum placental thickness (MPT) via two-dimensional ultrasound could serve as a reasonable alternative for estimating placental size, it will be noted that the thickness of the placenta in the first trimester was correlated with birthweight.[6]The present study was conducted to assess first trimester placental thickness for prediction preeclampsia or small gestational age.

MATERIALS & METHODS

The study was carried out on 78 singleton pregnancy,gestational age from 11to14weeks and reliable last menstrual period. All gave their written consent to participate in the study.

Data such as name, age, etc. was recorded. Fetal biometry (BPD, FL, AC), estimated fetal body weight, amniotic fluid index (AFI), blood pressure, lower limb edema and biochemical analysis for proteinuria, mode of delivery, andAPGAR score at one minute and five minutes from the time of birthwas recorded. Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Demographic data

Parameters	Variables	Number	P value
Parity	Primigravida	32	0.75
	Multigravida	24	
	Grand multigravida	22	
Residence	Rural	40	0.96
	Urban	38	
Education	Illiterate	30	0.05
	High and above	48	

Table I shows that parity was primigravida in 32, multigravida in 24 and grand multigravida in 22. Residence was rural in 40 and urban in 38. Education was illiterate in 30 and high and above in 48 cases. The difference was non- significant (P> 0.05).

Table II Comparison between ultrasonographic finding

Parameters	Without PE	With PE	P value
Placental thickness (mm)	0.9	0.7	0.05
Uterine Artery Index (UAI)	0.5	1.2	0.03
Umbilical artery Index at 2nd trimester	0.6	0.9	0.05
Umbilical artery Index at 3rd trimester	0.7	0.8	0.05
Post delivery fetal weight(kg)	3.2	2.7	0.01
Post delivery placental weight (kg)	0.51	0.42	0.02

Table II, graph I shows that placental thickness (mm) found to be 0.9 and 0.7, uterine artery index (UAI) was 0.5 and 1.2, umbilical artery index at 2nd trimester was 0.6 and 0.9, umbilical artery index at 3rd trimester was 0.7 and 0.8, post- delivery fetal weight (kg) was 3.2 and 2.7 and post- delivery placental weight (kg) was 0.51 and 0.42 in patients without PE and patients with PE respectively. The difference was significant (P< 0.05).

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Graph IComparison between ultrasonographic finding

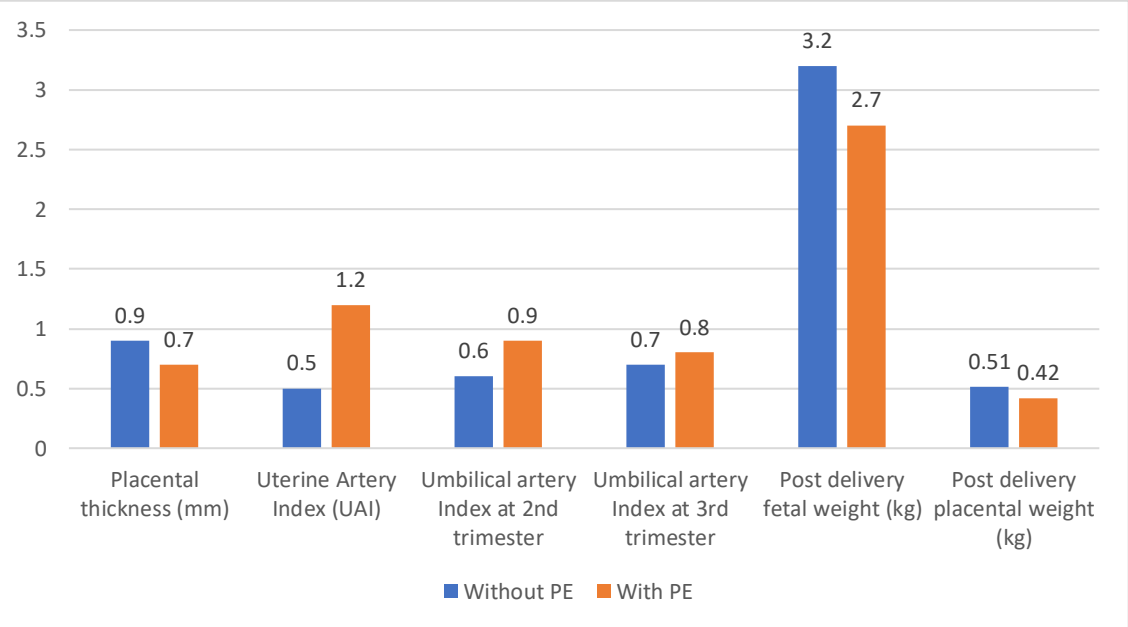

Table III Characteristics of the patients with and without small gestational age (SGA)

Parameters	Without SGA	With SGA	P value
Placental thickness (mm)	1.05	0.8	0.02
Uterine Artery Index (UAI)	0.7	1.6	0.01
Umbilical artery Index at 2nd trimester	0.6	1.8	0.01
Umbilical artery Index at 3rd trimester	0.7	1.9	0.01
Post delivery fetal weight (kg)	3.2	2.3	0.02
Post delivery placental weight (kg)	0.53	0.46	0.05

Table III shows that placental thickness (mm) was 1.05 and 0.8, uterine artery index (UAI) was 0.7 and 1.6, umbilical artery index at 2nd trimester was 0.6 and 1.8, umbilical artery index at 3rd trimester was 0.7 and 1.9, post- delivery fetal weight (kg) was 3.2 and 2.3 and post- delivery placental weight (kg) was 0.53 and 0.46 in patients without SGA and with SGA respectively. The difference was significant (P< 0.05).

Table IV Comparison between APGAR score at one and five minutes

Parameters	1 minute	5 minutes	P value
Without PE	8	9	0.52
With PE	7	9	
Without SGA	7	9	0.84
With SGA	8	9	

Table IV shows that APGAR score in patients without PE and with PE at 1 minute was 8 and 7 and at 5 minutes was 9 and 9 respectively. APGAR score in patients without SGA and with SGA at 1 minute was 7 and 8 and at 5 minutes was 9 and 9 respectively.The difference was non- significant (P> 0.05).

DISCUSSION

The usefulness of sonographic evaluation of placental morphology in the first and second trimester as an independent predictor of preeclampsia and FGR has been assessed by multiple authors.[7] When pregnancy is complicated by FGR, they are generally linked to a smaller placental weight post-delivery.[8]Preeclampsia and fetal growth restriction are significant obstetric clinical situations that concern obstetricians in their daily practice, and they have been shown to be linked to gross and histopathologic placental pathologies.[9] The thickness of the placenta shows a tendency to rise in a linear manner as gestational age advances. It can be observed sonographically that this is about 1 mm per week, and the thickness of the placenta serves as an approximation for gestational age.[10]

We found that parity was primigravida in 32, multigravida in 24 and grand multigravida in 22. Residence was rural in 40 and urban in 38. Education was illiterate in 30 and high and above in 48 cases. Ali et al[11]evaluated the relation between first-trimester Maximal placental thickness (MPT) and the subsequent risk of preeclampsia and small gestational age (SGA) neonate. 152 pregnant women were enrolled. In each visit the following was measured:

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Fetal biometry (BPD, FL, AC), estimated fetal body weight, amniotic fluid index (AFI). Clinical findings: blood pressure, lower limb edema and biochemical analysis for proteinuria. They were followed up till delivery, where maternal and fetal outcomes were assessed. The ultrasonographic data showed that, the patients developed pre-eclampsia had significantly decreased placental thickness, higher uterine artery index on the first visit, higher umbilical artery index in the second and third trimesters, lower post-delivery placental weight, and lower post-delivery fetal weight when compared with patients without pre-eclampsia. The participant with SGA had significantly thinner placenta, higher uterine artery index on the first visit, higher umbilical artery index in the second and the third trimester, lower post-delivery placental weight, and lower post-delivery fetal weight when compared with women without SGA.

We found that placental thickness (mm) found to be 0.9 and 0.7, uterine artery index (UAI) was 0.5 and 1.2, umbilical artery index at 2nd trimester was 0.6 and 0.9, umbilical artery index at 3rd trimester was 0.7 and 0.8, post- delivery fetal weight (kg) was 3.2 and 2.7 and post- delivery placental weight (kg) was 0.51 and 0.42 in patients without PE and patients with PE respectively. Vachon-Marceau C et al[12]recruited 991 participants at a mean gestational age of 12.7 ± 0.7 weeks of gestation. SGA (n = 52) was associated with reduced 1st trimester placental thickness (median: 0.89 MoM; interquartile (IQ): 0.75-1.02 vs 0.98 MoM; IQ: 0.84-1.15; $p < 0.01$). Pregnancies that developed preeclampsia (n = 20) tended to have greater placental thickness (median: 1.10 MoM; IQ: 0.93-1.25 vs 0.97 MoM; IQ: 0.84-1.14; $p = 0.06$) with values > 1.2 MoM significantly increasing the risk for preeclampsia (relative risk: 3.6; 95%CI: 1.5-8.6, $p < 0.01$). Pregnancies complicated by both SGA and preeclampsia (n = 5) had similar placental thickness in the first-trimester in comparison with uncomplicated pregnancies (median: 1.03 MoM; IQ: 0.89-1.42 vs 0.98 MoM; IQ: 0.84-1.14; $p = 0.33$).

We found that placental thickness (mm) was 1.05 and 0.8, uterine artery index (UAI) was 0.7 and 1.6, umbilical artery index at 2nd trimester was 0.6 and 1.8, umbilical artery index at 3rd trimester was 0.7 and 1.9, post- delivery fetal weight (kg) was 3.2 and 2.3 and post- delivery placental weight (kg) was 0.53 and 0.46 in patients without SGA and with SGA respectively. Alkafrawy SI et al[13]included 150 pregnant women with singleton pregnancy. All women were assessed by full medical history and physical examination. Clinical examination preceded the routine laboratory investigations. Finally, an ultrasound was performed and repeated each weak from 11 to 14 gestational weeks to determine crown-lump length and measure maximum placental thickness. Preeclampsia with preterm delivery recorded for 5 females, preeclampsia without preterm delivery developed in13 females, preeclampsia with SGA (5 females) and SGA among 7 females; and 116 non-complicated pregnancies. Cesarean delivery was performed for 80 females (54.8%). There was significant progressive increase of maximum placental thickness (MPT) from the 11th to the 14th weeks of gestation. Preeclampsia was associated with significant increase of MPT, while SGA was associated with significant reduction of it. The area under the curve was more than 0.7. For preeclampsia, the sensitivity was 88.89% at cutoff value > 1.0; while for SGA, the sensitivity was 100.0% at cutoff value ≤0.94.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that there exists a strong correlation between placental thickness and the development of small gestational age and preeclamptic toxemia; however, incorporating different Doppler indices would enhance the predictive value of maximal placental thickness for small-for-gestational.

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