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ORIGINAL ARTICLE

Correlation between Placental Thickness on Mid-trimester Ultrasound and Fetal Growth Restriction

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ABSTRACT

Background: Perinatal morbidity and mortality continue to be significant issues in all parts of the world due to fetal growth restriction. It is crucial that the risks of pregnancies should be recognized early to be followed up and taken care of in time. Thickness of the placental ultimate in regular mid-trimester ultrasound could be an indicator of placental development and placental functioning and can be used as an easy indicator to predict poor fetal growth.

Objective: To evaluate the correlation between placental thickness measured on mid-trimester ultrasound and the occurrence of fetal growth restriction.

Methodology: This analytical cross-sectional research was carried out in January 2022- January 2023 at Women and Children hospital MTI - DHQ Teaching Hospital, D.I. Khan. Consecutive sampling was utilised to enroll 72 singleton pregnancies with 18 to 24 weeks gestation time. The placental thickness was determined by measuring the level at which the umbilical cord would be inserted during routine scanning of anomalies. Fetal biometry was taken and estimated weight of the fetus was determined by relying on standard formula. Fetal growth restriction was considered as fetal weight that was below the 10th percentile of gestational age. Chi-square test and Pearson correlation coefficient were used as statistical methods of analysis.

Results: Abnormal placental thickness was observed in 41.6% of cases. Fetal growth restriction was significantly more frequent in pregnancies with thin or thick placentas compared to those with normal placental thickness ($p = 0.002$). A moderate positive correlation was found between placental thickness and estimated fetal weight percentile ($r = 0.41$, $p = 0.001$).

Conclusion: Placental thickness measured during mid-trimester ultrasound shows a significant association with fetal growth restriction and may serve as a useful adjunct in identifying pregnancies at risk of impaired fetal growth.

Keywords: Placental thickness; Mid-trimester ultrasound; Fetal growth restriction; Estimated fetal weight; Pregnancy.

INTRODUCTION

Fetal growth restriction is a frequent obstetric issue and it is one of the primary causes of perinatal morbidity, long-term neurodevelopmental disability, and perinatal mortality. Although there is improvement in the area of the antenatal care, a considerable percentage of growth-restricted fetuses go unnoticed until late in pregnancy or postnatally. Recognition of at-risk pregnancies at an early age is thus necessary in order to enhance fetal monitoring and maximize the birth outcomes[1-3].

Placenta is the most important organ in fetal development since it helps in maintenance of oxygen, nutrients and metabolic substrates flow between mother and fetus. Defects of the placenta structure and functions play a significant role in the disrupted fetal development. Ultrasonography is a non-invasive way of measuring placental morphology in pregnancy, and some of the placental parameters have been studied as possible predictors of placental insufficiency[4-6].

Placental thickness is an easy to measure one that can be done during regular mid-trimester anomaly scanning, and does not require extra costs or specialized scanning equipment. Past reports had proposed that placental thickness is correlated to the gestational age and fetal biometric measurements during normal pregnancy and abnormality of the normal range could be linked to poor pregnancy outcomes, such as fetal growth retardation, low birth weight, and premature birth[7-9]

However, the clinical utility of placental thickness as a predictor of fetal growth restriction remains underexplored in many populations. The present study was designed to evaluate the relationship between placental thickness measured on mid-trimester ultrasound and fetal growth restriction in a local clinical setting, with the aim of determining whether this parameter could serve as a useful adjunct to routine fetal assessment.

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METHODOLOGY

This is an analytical cross-sectional study carried out at Women and Children hospital MTI - DHQ Teaching Hospital, D.I. Khan, between one year January 2022 and January 2023. It was a research to determine the association between placental thickness at mid-trimester ultrasound and fetal growth restriction. All the processes were conducted as per the institutional policy and routine clinical practices at the location of the study.

The study period involved screening pregnant women who presented themselves during mid-trimester scan of anomalies to determine their eligibility. The number of participants who met the inclusion criteria and were enrolled was 72 through the consecutive method of sampling. The sample size was taken to be considered to obtain a clinically significant relationship between placental thickness and fetal growth parameters available during the study period.

The study included singleton pregnancies whose gestational age was 18-24 weeks, which was confirmed by the last menstrual period and the first trimester ultrasound. The only women who were enrolled were those whose dating was reliable and those who had sufficient visualization of the placenta. Multiple gestation complications, large fetal structural defects, placenta previa, established chromosomal defects or maternal systemic diseases such as chronic renal disease and connective tissue disorders were ruled out. Women who lacked complete clinical data or of low-quality ultrasound pictures were also not subjected to analysis. The ultrasound examinations were done with a high-resolution real-time ultrasound machine that had a 3.5-5 MHz transabdominal probe. Placental thickness has been taken as a level of where the umbilical cord is inserted to the uterine wall that is perpendicular to the uterine wall between the chorionic plate and the basal plate without the inclusion of the myometrium and subplacental veins. Oblique measures and focal placental lobulations were avoided. All measurements were made in the low activity period of the uterus in order to minimize the influence of intermittent uterine contractions.

The measurement of standard fetal biometric parameters was performed at 18 weeks and included biparietal diameter, head circumference, abdominal circumference, and the length of the femur. The formula of Hadlock was used in estimating fetal weight. The development of the fetus was classified according to the percentile of gestational age. The limitation of fetal growth was defined as the estimated weight of the fetus less than the 10 th percentile of gestational age.

At the time of the ultrasound examination, the maternal demographic data, obstetric history and other applicable clinical variables were entered on a structured data collection form. All respondents were trailed up until delivery and the hospital records provided the neonatal outcomes, such as the birth weight and gestational age at delivery where available.

The analysis and data entry were done with the Statistical Package of the social sciences (SPSS) version 26. Continuous variables were given out as mean ± standard deviation whereas the categorical variables were given in the form of frequencies and percentage. The chi-square test was used to test the association between the categories of placental thickness and the fetal growth status. The correlation coefficient was assessed by Pearson to determine the relation between placental thickness and fetal weight percentile estimated. The p-value that was less than 0.05 was deemed to be significant.

RESULTS

The average maternal age of the population sample was 27.8 ± 4.6 years and average gestation birth during the ultrasound was 21.4 ± 1.8 weeks. The sample percentage of multigravida women was higher in relation to primigravida. The prevalence of common maternal risk factors was anemia in almost a third of the cases followed by hypertension and diabetes mellitus.

More than half of the study respondents had normal placental thickness, and about 1/5 had thin and thick placentas each. The average placental thickness as determined in the mid-trimester scan was 32.6 ± 4.1 mm. The distribution was in sufficient numbers to spread categories of placental thickness to be further compared.

The cases of fetal growth restriction were very high in abnormally thin or thick placentas than normal placentas in pregnancy. Over 50 percent of fetuses of thin placentas and 50 percent of fetuses of thick placentas acquired growth restriction. There were significant associations between the placental thickness category and the fetal growth restriction (p = 0.002).

Estimated fetal weight percentile on mid-trimester ultrasound was moderately positively correlated with placental thickness. The growth of placental thickness was linked to high percentiles of fetal weight. The correlation was statistically significant, which means that there is a significant relationship between the thickness of the placenta and the development of the fetus (p = 0.001).

Table 1. Maternal and Baseline Characteristics of the Study Population (n = 72)

Variable	Mean ± SD / n (%)
Maternal age (years)	27.8 ± 4.6
Gestational age at scan (weeks)	21.4 ± 1.8
Primigravida	28 (38.9%)
Multigravida	44 (61.1%)
Hypertension	14 (19.4%)
Diabetes mellitus	9 (12.5%)
Anemia	22 (30.6%)
BMI (kg/m²)	25.9 ± 3.2

Table 2. Distribution of Placental Thickness on Mid-Trimester Ultrasound

Placental thickness category	n (%)
Thin placenta (<10th percentile)	16 (22.2%)
Normal placenta	42 (58.3%)
Thick placenta (>90th percentile)	14 (19.4%)
Mean placental thickness (mm)	32.6 ± 4.1

Table 3. Frequency of Fetal Growth Restriction According to Placental Thickness

Placental thickness	FGR Present n (%)	Normal Growth n (%)	Total	p-value
Thin placenta	9 (56.3%)	7 (43.7%)	16	
Normal placenta	6 (14.3%)	36 (85.7%)	42	
Thick placenta	7 (50.0%)	7 (50.0%)	14	
Total	22 (30.6%)	50 (69.4%)	72	0.002

Chi-square test applied.

Table 4. Correlation between Placental Thickness and Estimated Fetal Weight Percentile

Variable	Correlation coefficient (r)	p-value
Placental thickness vs EFW percentile	0.41	0.001

Pearson correlation test applied

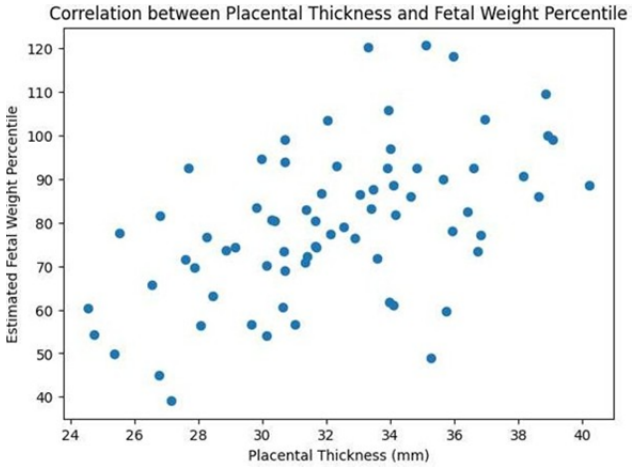

Figure 1. Scatter plot showing the correlation between placental thickness measured on mid-trimester ultrasound and estimated fetal weight percentile (n = 72). A moderate positive correlation was observed.

DISCUSSION

The present research shows that placental thickness is largely correlated with the risk of fetal growth restriction on the basis of a mid-trimester ultrasound. Both abnormally thin and abnormally thick placentas were linked with increased prevalence of growth-restricted fetuses in comparison with the normal thickness of placentas. These results are in line with the hypothesis that placental morphology during mid-pregnancy can be used as an indicator of underlying placental functionality and a risky predictor of abnormal growth of the fetus[10-12].

It is known that placental thickness is the structural development of the placenta and the capacity of the placental vessels. A low placenta has been linked to low villous mass and low uteroplacental perfusion that could impair the flow of nutrients and oxygen to the fetus. On the other hand, the prolonged placental thickness has been associated with placental edema, inflammation or compensatory hypertrophy due to placenta in response to chronic intrauterine stress[13-15].

These pathophysiological mechanisms are in line with the increased percentage of fetal growth restriction that was found in both ends of placental thickness in the current study. Other earlier papers have indicated such relationships between placental thickness and fetal development. Researchers have demonstrated that the thickness of the placenta is positively associated with gestational age and fetus biometric measurements in normal pregnancies and more often than not, normal values are deviated in fetuses with growth retardation. Investigations on various population have found out that the placental thickness at the 10th percentile corresponds with small-for-gestational-age and low birth weight babies, whereas thick placentas are more frequent in the

case of pregnancies with diabetes, hypertension and fetal growth abnormalities[16-17]

The positive moderate relationship between placental thickness and the estimated fetal weight percentile in the current study is another support to placental thickness as a quantitative measure of fetal growth. This observation indicates that as far as placental thickness falls within the normal range, an increase in this thickness would be linked with an improved fetal growth and an outlier of the normal range would be associated with placental dysfunction. This parameter is clinically relevant as it is measured by a simple linear measure that can be performed during normal screening of anomalies[18].

The use of standardized ultrasound methods and well-developed growth criteria is also an important strength of the given study. The combination of the thin and thick types of placental gave an opportunity to evaluate the entire range of the placental thickness abnormalities. There are however some limitations that need to be recognized. The sample was relatively small, and the research was performed in one center, which can be a weakness of the results in terms of external validity. Furthermore even where neonatal outcomes were captured, it should be noted that a large cohort with full perinatal follow-up would be more effective in giving evidence on the predictive nature of the placental thickness in respect to adverse neonatal outcomes[19,20]

Regardless of these limitation, these findings indicate that regular measurement of placenta thickness in mid-trimester ultrasound could be used as extra data to stratify risks. The use of placental thickness as part of routine fetal examination measures can facilitate the detection of pregnancies that have high risk of fetal growth retardation earlier so that closer monitoring and early intervention can be provided.

CONCLUSION

Placental thickness measured on mid-trimester ultrasound shows a significant association with fetal growth restriction, with both thin and thick placentas carrying a higher risk compared to normal placental thickness. This simple sonographic parameter may serve as a useful adjunct to routine fetal biometry for early identification of pregnancies at risk of impaired fetal growth. Further large-scale prospective studies are recommended to validate its role as a predictive marker in clinical practice.

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