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ORIGINAL ARTICLE

Correlation Between Gestational Age of Pregnant Women in Their 3rd Trimester and Placental Thickness Measured with Ultrasonography

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Abstract

Background: **The placenta, an organ of the foetus, serves as the physiological link between the expectant mother and the foetus.**

Aim and objectives: **We aimed to look into the connection between third-trimester gestational age and ultrasound-measured placental thickness (PT).**

Subjects and methods: **From February 2022 to October 2022, 200 pregnant women who were antenatal clinic attendees at Al-Hussien and Sayed Galal University Hospitals participated in this cross-section prospective observational study. Ultrasound was done for measuring the PT in all women.**

Results: **Mean GA was 33.79 ± 3.65 weeks and mean PT was 35.82 ± 5.74 mm. Compared to gestational age and birth weight, PT showed a considerable positive connection.**

Conclusion: **Measurement of PT by ultrasound is a good predictor tool for estimating the fetal weight. Increased PT is not a sign of any particular condition, although it may help in managing a foetus who is at risk.**

Keywords: Fetal, Gestational age, Placenta, Ultrasound, Weight

1. Introduction

The placenta serves as a mirror, reflecting both the mother's and the fetus's state. It is the fetomaternal organ in charge of delivering endocrine secretions and selective transfer of substances to and from the foetus. Understanding placenta formation is vital since the placental trophoblast are essential for a healthy pregnancy.[1]

Fetal weight estimation and placental size evaluation are both possible with the aid of obstetric ultrasonography. The simplest way to measure a placenta's dimensions is to measure its thickness. However, The sonographically determined 'normal' placental thickness (PT) is poorly understood. A placenta with a thickness of more than 4 cm has historically been considered abnormal and linked to a number of unfavourable consequences.[2]

The placenta's thickness, which is strongly linked to foetal development and may have a substantial impact on the neonatal outcome, is around 3 cm thick and measures 15−25 cm in diameter at term.[3] A "warning limit" of placental diameter of 18 cm and PT of 2 cm at 36 weeks is used to predict low birth weight neonates.[4] Significant maternal diabetes mellitus, chromosomal abnormalities, preeclampsia, recurrent foetal infections, and intrauterine growth limitation are all linked to small placentas.[3] Diabetes mellitus, perinatal infections, and hydrops fetalis are a few disorders that have been linked to placentas that are above 4 cm thick at term.[5]

Due to increased rates of foetal abnormalities and both term infants that are small for gestational age (GA) and huge for gestational age, perinatal morbidity and mortality were significantly more common in gravida with thick placenta.[6]

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Because a lot of individuals do not understand last menstrual period (LMP) and irregular menstrual periods, the GA is usually exaggerated or underestimated. In order to identify patients who were experiencing intrauterine growth retardation, our study looked into PT as a measure for assessing foetal age (IUGR). We set out to look at the relationship between ultrasound-measured PT and third-trimester GA.

2. Patients and methods

Following approval from the Institutional Ethical Committee, the current prospective study was carried out on 200 pregnant women attending antenatal clinics at Al-Hussien and Sayed Galal University Hospital during the months of February 2022 and October 2022. The study was explained to the study population and a written consent was obtained from each patient.

2.1. Inclusion criteria

Singleton pregnancy, GA more than 26 weeks, Age group of 21–35 years, history of regular menstruation, and latest menstrual cycle known.

2.2. Exclusion criteria

Conditions that are specifically associated to pregnancy, such as polyhydramnios, twins, gestational diabetes, hydrops fetalis, intrauterine growth restriction, gestational hypertension, and irregular menstrual cycles, and abnormal menstrual periods Placenta and inadequate placental visualisation.

2.3. Methods

All included patients were subjected to the following:

2.3.1. History taking

Personal data: Name, age, residency, occupation, special habits, phone numbers, socioeconomic status, husband name, occupation and smoking. **Past medical and surgical history:** History of DM, hypertensive disorders, cardiac problems, renal disease, chest troubles and past history of laparotomies or other operations. **Menstrual history:** LMP and estimate GA. **Obstetric history:** Including complete information about prior pregnancies (date, outcome, onset and mode of delivery, GA at delivery and any associated complication). **History of present pregnancy:** Including medical and surgical conditions to define high-risk factors and exclusion criteria.

2.3.2. Examination

General examination: Vital signs (blood pressure, pulse and temperature) and examination of the head and neck, chest, heart and limbs. **Abdominal examination:** fundal level, monitoring of uterine contractions, auscultation of FHS, presence of scar of previous laparotomy and abdominal signs of pregnancy. **Laboratory investigations:** Blood type, complete blood count, blood sugar level, and urine analysis are used to rule out any exclusion criteria.

2.4. Ultrasonographic examination

2.4.1. The sonographic technique of placental thickness measurement

A Toshiba colour Doppler scanner with a 3.5 MHz convex transducer is positioned at the site of the cord insertion perpendicular to the placental plane.

2.4.2. Follow up the patient till delivery

The patients were followed up at the antenatal clinic of Hussien and Sayed Galal University Hospital the antenatal protocoal. The patient should appear at scheduled visits, they was call up by phone and asked to report to the investigation.

Delivery of all patients and the outcomes documented whether in or outside the hospital.

All data was collected in sheets of papers, which were designed especially for the study, then the GA in weeks and PT in millimetres were compared.

2.5. Statistical analysis

Using SPSS 22.0 for Windows, all data were gathered, tabulated, and statistical evaluation (SPSS Inc., Chicago, IL, USA).

The Shapiro Walk test was employed to determine whether the data distribution was normal. Frequencies and relative percentages were employed to depict qualitative data. The difference between the qualitative variables was ascertained using the chi-square test (2) and Fisher exact, as shown. Mean and Standard Deviation were used to express quantitative data (standard deviation), respectively, for parametric and non-parametric data. To compare quantitative variables in two groups for parametric and non-parametric variables, respectively, independent *T* test and Mann Whitney test were utilised.

3. Results

3.1. Discussion

Numerous factors affect foetal health, but the most crucial one for having a healthy baby is a

placenta in good health. The organ that gives the foetus oxygen and nutrition is the placenta. A healthy placenta is necessary for normal foetal growth and subsequent birth weight.[7]

Since ultrasound is currently the most accurate method of dating pregnancies, the goal of this study was to determine whether there was any correlation between third-trimester GA and ultrasound-measured PT. Our data analysis revealed that women's mean ages were 30.56 and 4.55 years, and their average BMIs were 28.6 and 3.69 kg/m2. The median rural patient population was 55.5%, and the median parity was 1.55. Compared to our findings, Nour Eldin et al.[8] 's study in which 200 women overall were included. In our investigation, the average maternal age was 26.48 + 5.29.

More than half (65,5%) of women were between the ages of 20 and 29, while 27% of instances were people in their 30 s or older, and only 7.5% involved people under 20.

In another study of **Ali AZ** et al.,[9] age of patients ranged between 20.0 and 35.0 years with a mean age of 29.35 ± 2.94 years in the present study. Patients <25 were 6 (6.0%), Patients 25–30 were 58 (58.0%), and Patients >30 were 36 (36.0%). GA ranged between 18.0 and 38.0 weeks with a mean age of 28.34 ± 4.44 weeks in the present study. Patients ≤26 (2nd trimester) were 30 (30%) and Patients >26 (3rd trimester) were 70 (70.0%).

Furthermore, **Abdelhamid** et al.,[4] was conducted on a total of 100 women, In our study, the mean mother age was 28.46 + 4.6. Women aged 19 to 38 made up this group. The maternal BMI in our study was ranged from 21 to 36 with Mean ± SD was 27.82 ± 3.2. In the current study, mean GA was 33.79 ± 3.65 weeks and mean PT was 35.82 ± 5.74 mm.

Habib[10], According to his study, the PT was 22 mm in foetuses that weighed less than 2500 g and 34.8 mm in foetuses that weighed more than 2500 g at 36 weeks. They came to the conclusion that PT was an indicator of LBW babies. Additionally, the outcomes of the study conducted by Afrakhteh et al.,[11] resembled those of ours. According to this study, the average placental weight was 551.7 g and the average birth weight was 305.56 g. The changes in PT seen in the second and third trimesters were 21.684.52, 36.266.46, and 14.675.67 mm, respectively. PT and birth weight had a strong positive relationship in the second and third trimesters. ($r = 0.15$, $P = 0.03$; $r = 0.14$, $P = 0.04$, respectively). According to Ohagwu et al.,[12] data, PT was 32.524.94 at week 26 and 42.495.79 at week 38 of pregnancy. PT often grew linearly with GA.

Furthermore, bi-parietal diameter (BPD) and PT showed a high positive correlation in both the second and third trimesters. Because they found a linear link even with the AC, an important metric in estimating foetal weight, the PT may be the first sign of foetal abnormalities. The increase in PT (mm) in the second trimester for the entire sample, and third trimester was positively correlated with GA in Ali A et al. study.'s,[9] with PT increasing as GA increased. The average GA was 34.93 3.57 for GAs under 26 and 36.50 3.07 for GAs beyond 26. PT increases as GA rises. It has become crucial to accurately determine GA in order to timing the pregnancy's termination appropriately and to track the foetus' progress throughout the entire pregnancy. Numerous research were conducted in an effort to establish a connection between the PT, GA, and estimated foetal weight in addition to the standard foetal biometry measures.[13]

From 12 to 34 weeks of gestation, the PT (in mm) and GA (in weeks) are nearly equal as they climb, according to studies by Banik et al. GA and PT were shown to be strongly correlated ($r = 0.966$). The association was statistically significant with a P value of 0.001. Furthermore, it was demonstrated that PT and estimated foetal weight in the second and third trimesters had a substantial correlation in a group without IUGR (P 0.05).[13]

The placental volume remained lower even though there was a significant relationship between GA and placental volume in the growth-restricted foetuses.[14]

The relationship between PT and growth metrics is essential because aberrant PT for a GA may be the earliest indication of foetal development retardation.[13]

In addition to above findings, it was noted in the current study that mean birth weight was 3.16 ± 0.428 kg and mean Apgar at 1 min was 7.23 ± 1.27 while mean Apgar at 5 min was 9.7 ± 1.09 meanwhile 57.5% of the neonates were males.

In a harmony with our findings, the study of **Pietravalle** et al.,[15] reported that birth weight was 2795 (2702–3345) kg and mean Apgar at 1 min was 8 (7–8) while mean Apgar at 5 min was 10 (10–10) meanwhile 40 (57%)of the neonates were males.

In the study of **Abdelhamid** et al.,[4] reported that the neonatal outcome which depends on (Apgar score, weight) show 90 babies their weights were more than 2500 g and another 10 babies their weights less than 2500 g, and 83 babies their Apgar score were more than 8 and did not need neonatal ICU. The other 17 babies need neonatal ICU. A substantial positive correlation between PT, birth weight, and GA was discovered in the current study. According to Afrakhteh et al. study 's[11] the average birth weight was 305.56 657.0 g and the average placental weight was 551.7 104.8 g. This agrees with what we discovered. The PT measured by ultrasonography in the

Table 1. Demographic characteristics among the studied patients.

	The studied patients ($n = 200$)
Maternal age (years)	
Mean ± SD	30.56 ± 4.55
BMI (kg/m^2)	
Mean ± SD	28.6 ± 3.69
Parity	
Mean ± SD	1.55 ± 1.14
Residence	
Rural	111 (55.5%)
Urban	89 (44.5%)

This table shows mean age 30.56 ± 4.55 years with mean BMI 28.6 ± 3.69 kg/m^2. Mean parity was 1.55 ± 1.14 with 55.5% of the patients were rural.

second and third trimesters, including any inter-trimester alterations, were 21.68 4.52 and 14.67 5.67 mm, respectively. In the second and third trimesters, there was a significant positive connection between PT and birth weight (r = 0.15, $P = 0.03$, and r = 0.14, $P = 0.04$, respectively). Additionally, Mathai et al. noted that there was a positive correlation between PT and ultrasonographic GA in both groups of 498 patients (outcome foetal weight 2500 g, $n = 122$) and Group B (foetal weight >2500 g, $n = 376$). (P value of 0.01). Regression analysis in both groups reveals linear associations between PT and GA. Additionally, Keshavarz et al. found in their study[16] that there was a highly significant positive linear association between GA and PT (P.001; r = 0.93). This was confirmed by the Pearson correlation coefficient.

Table 2. Gestational age and placental thickness among the studied patients.

	The studied patients ($n = 200$)	
	Mean ± SD	Range
GA (weeks)	33.79 ± 3.65	29–41
Placental thickness (mm)	35.82 ± 5.74	26–47

This table shows that mean GA was 33.79 ± 3.65 weeks and mean placental thickness was 35.82 ± 5.74 mm.q7.

Table 3. Neonatal outcome among the studied groups.

	The studied patients ($n = 200$)
Birth weight (kg)	
Mean ± SD	3.16 ± 0.428
Apgar at 1 min	
Mean ± SD	7.23 ± 1.27
Apgar at 5 min	
Mean ± SD	9.7 ± 1.09
Gender, *n* (%)	
Male	115 (57.5%)
Female	85 (42.5%)

This table shows that mean birthweight was 3.16 ± 0.428 kg and mean Apgar at 1 min was 7.23 ± 1.27 while mean Apgar at 5 min was 9.7 ± 1.09 meanwhile 57.5% of the neonates were males.

Table 4. Correlation between placental thickness with gestational age and birth weight.

	Placental thickness	
	r	*P*
Gestational age	0.619	<0.001
Birth weight	0.754	<0.001

The data in this table show a strong correlation between placental thickness, birth weight, and gestational age.

With rising estimated foetal weights, a nonlinear increase in PT was seen. Calculations of the 2.5th, 5th, 10th, 25th, 50th, 75th, 90th, 95th, and 97.5th percentiles of PT were made using the GA-specific PTs. In conclusion, using ultrasound to determine PT is a good predictive technique for determining foetal weight. Increased PT is not a sign of any particular condition, although it may help in managing a foetus who is at risk. In the third trimester, The increase in GA was strongly correlated with placenta thickness.

3.2. Conclusion

According to the results of our study, PT can be utilised to forecast the GA in women whose LMP is uncertain or unreliable. In the third trimester, Placenta thickness and the progression of GA were strongly correlated (Tables 1–4).

Consent for publication

I verify that all authors have agreed to submit manuscript.

Availability of data & material

Available.

Funding

Self efforts and all cases done in gynecology and obstetric department of Alazhar University.

Conflicts of Interest

No conflicts of interest exist between the authors and the publication of this paper, they claim.

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