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A CROSS-SECTIONAL STUDY EXAMINING A LINK BETWEEN PLANCENTAL THICKNESS AND GASTATIONAL AGE IN PREGNANT WOMEN OF BALUCHISTAN

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ABSTRACT

Background and Aims: Assessment of fetal well-being is dependent on GA, and determination of the estimated gestational age (GA) is crucial. The inclusion of placental thickness and fetal biometrics in prediction of GA may enhance the accuracy of fetal age assessment. The objective was to investigate the correlation of placental thickness with GA in pregnant mothers going to prenatal/emergency department at Mekran Hospital Baluchistan, Pakistan.

Methods: This correlation were examined among pregnant mothers referring to prenatal care in Baluchistan hospitals in a 6-month period since the study was a cross sectional research. Written informed consent was obtained, and information on date of first day of last safe menstruation, mean body mass index (BMI), and medical or surgical history was collected. Placental thickness was assessed by ultrasound and miscellaneous clinical information was noted. Analysis: the data was analyzed by finch and correlation analysis in SPSS version 21.

Results: We found a strong association of GA with placental thickness ($p < 0.0001$, $r = 0.729$). The PT increased as a function of the GA. There was a similar association between placental thickness and the site of attachment ($p = 0.009$, $r = 0.14$). In the posterior position, placental thickness was greater by 14% or 0.14. The placental thickness at the posterior site (29.49 ± 0.75) was greater than that in the anterior one (26.94 ± 10.72).

Conclusion: The results of this study indicate that placental thickness increases significantly with increasing GA in the first and second trimesters. Furthermore, placental thickness was significantly higher in cases of posterior placental location as well as in association with high BMI. Placental thickness should therefore be measured routinely during obstetric ultrasound.

Key Words: GA, maternal BMI, placenta, placental thickness, posterior placental, pregnancy.

INTRODUCTION

In perinatal care, knowledge of gestational age (GA) is essential for differentiating normal from abnormal pregnancy, scheduling screening tests, diagnosing intrauterine growth restriction and

making decisions about pregnancy termination. Calculate gestational age (GA) and customary time of delivery by the LMP. In these studies, the woman was required to have regular cycles and normal menstruation as well as have not taken birth control pills for 3 months.[1,2] However, approximately 30% of pregnant women don't have these prerequisites and LMP cannot be used to predict EDC (estimated date of confinement) accurately. At present, ultrasound is the gold standard for assessing GA via fetal measurements including crown-rump length (CRL), biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC) and femur length (FL). However, these criteria have limitations. For instance, Biparietal diameter too is unsafe in GA prediction using premature rupture of membranes babies by Wolfon et al. Accordingly, other parameters are essential in estimating GA in fetuses with preterm ROM (rupture of membrane).[3,4]

Consequently, attention has been focused on other potential assays and markers of diagnosis (e.g. thickness). The placenta appearance has been subject to attention over the last few years, due to its association with foetal growth and therefore fetal well-being. Mid-pregnancy changes in the placenta, especially between 17 and 20 weeks' gestation, have been found to have a close relationship with fetal growth and are predictive of abnormalities.[5-7]
Sonographic placental thickness is an easy and successful parameter to determine the GA. Head circumference, biparietal diameter, abdominal circumference and femur length (derived by sonography) are biometric measurements in the second trimester of pregnancy that have been proposed to date a pregnancy.[8,9] They are frequently used to assess GA alone or in combination. Studies have shown that placental markers are good at identifying children with either GA (GA-R) and intrauterine growth restriction (IUGR).[10,11]
There is also the use of GA for estimation to determine placental thickness (PT) which encourages more widespread routine measurement of PT by obstetricians on their patients.[12-15] This measure may be complemented by placental thickness for better corresponding with GA. **Many studies *Association between placental thickness and gestational age at various, weeks of gestation Several reports have shown a relation between PT and GA in different weeks., Of pregnancy but specific weeks are contentious.[12,16,17]

In addition, it has differed among breeds of dog and thickness of placenta[16] Because the accuracy in estimating GA is vital for evaluating fetal growth and development[7,18,19]; abnormal placentomegaly as an imaging feature was a significant finding in patients referred on pathological conditions[20,21] but has not been widely used in routine prenatal screening. The purpose of this study was to determine the correlation between placental thickness and GA in pregnant women referred to prenatal and emergency clinic at Baluchistan Hospitals, Pakistan.

MATERIALS AND METHODS

A cross-sectional evaluation with convenience sampling for 6 months in prenatal clinics of Baluchistan Hospitals, Pakistan. An ethical clearance was taken from the Mekran medical college Ethical Committee and then a written consent was obtained from each patient for permission to participate in this study. After explaining the study in detail and answering any questions from female informants, written consent was obtained from them before participation. The subject selection was similar in both studies and included pregnant women with a GA of 11 weeks or more, 20-35 years old, (c) no complications, (d) reliable LMP calendar date for the first day of LMP, (e) no history of surgery or medical disease, and/or (f) body mass index > 20 kg/[m.sup.2] and 4 weeks between amenorrhea and uterine height or the presence of oligohydramnios or polyhydramnios were exclusion criteria.

Scanning technique:

All women who met the inclusion criteria were reviewed by two participating radiologists using trans-abdominal ultrasound at Mekran teaching hospital.

The evaluations included:
I. Fetal Viability and Defect Detection.
II. Determination of GA.
III. Placental location.
IV. Fetal placental grading according to Grannum.
Ultrasound measurement of thickness was taken in the longitudinal axis from entrance site of umbilical cord on chorionic surface to inner surface of myometrial placenta. The entry of the umbilical cord into the placenta at its thickest part, underneath very close to the chorionic surface was identified as a V-shaped hypoechoic site. All placental measurements were obtained at uterine stasis, which the uterus was without contraction, since there is an increased in thickening of the placenta during contractions. The investigator noted the age, weight, height, current GA and OB history (gravidity; parity) variables.

Statistical analysis:
Data were processed with SPSS for Windows, version 22.0 (SPSS Inc.). Data were presented using mean and standard deviation, frequency, and percentage. Association between placental thickness and the studied parameters was carried out by Spearman's correlation analysis. The level of statistical significance for this study was $p < O.5$.

RESULTS
In this cohort study, most primiparous women had a BMI > 25 and an anterior placenta. The obstetric and clinical features of the study subjects are presented (Table 1).

TABLE NO.1: Obstetrical and clinical characteristics of the participants. (n=313)

Characteristic	N =313
Age(M±SD)	30.54±5.89
Gravidity N (%)	
1	112(35.8)
<1	201(64.2)
Parity N (%)	
Nulliparous	140(44.7)
Primiparous	148(47.3)
Multiparous	25(8)
BMI N (%)	
>25	99(31.6)
<25	187(59.7)
Location of the placenta N (%)	
Anterior	138(44.1)
Posterior	120(38.3)
Fundal	23(7.7)
Lateral	24(7.7)
Lowlying	5(1.6)

When exploring the association of US-based GA with placental thickness, a close statistical correlation was found and reported ($p = <0.0001$); indeed, the relation between placental thickness and GA was 0.729, this means that an increase in weekly GA corresponded to an increment of 72% or 0.72 on the ground gain of placental thickness. A correlation was analysed between maternal age and the degree of placental migration assessed by measuring the thickness of the placenta, showing a statistically significant relation ($p = 0.009$). There was also a weak association between thickness of placenta and position ($r = 0.148$). In posterior location, placental thickness rose by 0.14 or 14%. The average value of placental thickness (29.49 ± 0.75) was larger in the posterior part than in the anterior

(26.94 ± 10.72). A significant correlation between BMI and placental thickness was also determined (p = 0.029). The association between placental thickness and BMI was r = 0.129 from which for every increase in membranous placenta group, the placental thickness increased by 0.12 or 12% (Table 2).

TABLE NO.2: Investigating the relationship between the studied variables and the thickness of the placenta. (n=313)

Placental thickness		
	Type of test	**p-value**
Gestational age (weeks)	Spearman correlation R = 0.729	<0.0001
Maternal age	Spearman correlation R = −0.116	0.040
Location of the Placenta	Spearman correlation R = 0.148	0.009
Body mass index	Spearman correlation R = 0.129	0.029
Parity	Spearman correlation R= −0.046	0.420

There was a significant correlation between placental thickness and gestational age, especially in the first (less than 14 weeks) and second trimesters (Table 3).
Table 4 presents the mean and standard deviation of placental thickness at each GA as well as the 95% CI for reports of an accurate LMP or early U/S before 12 weeks.
Placental thickness increases in a positive and straight line with increasing GA. The proportion of between subject variability observed in placental thickness is 72% or 0.72 for increasing gestational age (Fig.1)

TABLE NO.3: Comparison of placental thickness based on pregnancy trimester. (n=313)

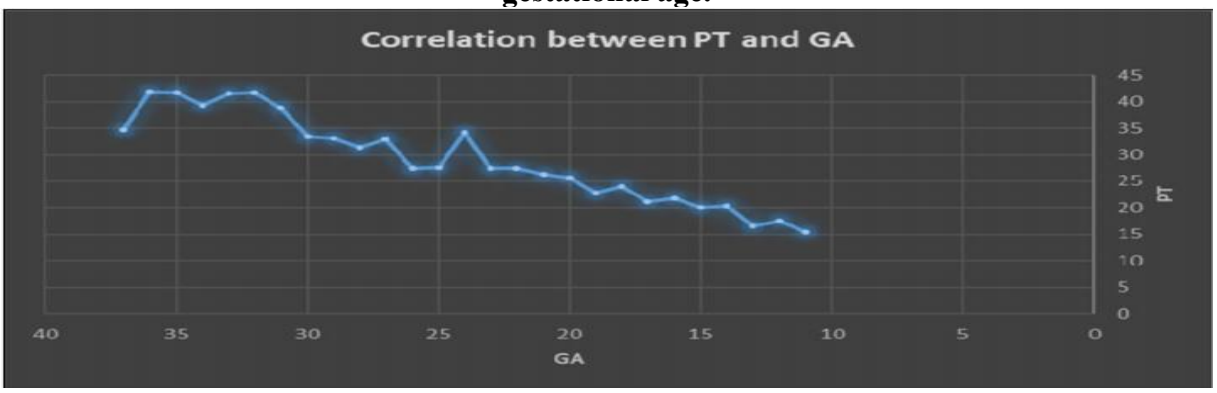
Trimester	Sample size	Correlation	p-value
First trimester	55	0.269	0.047
Second trimester	157	0.444	0.0001
Third trimester	101	0.088	0.381

TABLE NO.4: Average placental thickness for different ages of GA based on reliable LMP or ultrasound under 12 weeks.

			95% Confidence Interval for Mean	
Pregnancy week	**Mean**	**Std. deviation**	**Lower Bound**	**Upper Bound**
11.0	15.48	3.96	12.16	18.79
12.0	17.44	2.88	15.38	19.50
13.0	16.61	3.20	14.58	18.64
14.0	20.31	5.35	17.65	22.97
15.0	19.99	7.23	14.81	25.17
16.0	21.85	4.71	19.34	24.36
17.0	21.24	5.26	18.62	23.86
18.0	23.96	7.39	19.69	28.23
19.0	22.84	5.33	20.27	25.40
20.0	25.68	6.59	20.96	30.39
21.0	26.32	4.67	23.35	29.29

22.0	27.38	5.98	22.37	32.38
23.0	27.39	9.04	19.02	35.75
24.0	34.26	10.03	24.97	43.54
25.0	27.58	7.85	22.83	32.33
26.0	27.35	4.21	24.11	30.58
27.0	32.93	7.64	28.31	37.55
28.0	31.42	8.71	24.72	38.12
29.0	33.16	5.77	27.82	38.50
30.0	33.35	9.16	27.53	39.17
31.0	38.85	8.47	34.15	43.54
32.0	41.74	9.48	36.01	47.48
33.0	41.54	11.84	34.38	48.69
34.0	39.26	10.00	33.72	44.80
35.0	41.67	11.81	32.58	50.75
36.0	41.78	7.92	35.15	48.40
37.0	34.62	5.83	29.74	39.50
Total	28.68	10.82	27.47	29.88

FIGURE 1: Correlation between PT (placental thicknesses) and GA (GA) table. GA, gestational age.



DISCUSSION

In this study, we found an elevation in PT associated with higher GA during the first trimester (≤14 weeks) and the second trimesters. Furthermore, there was a significant rise in PT in posterior compared to anterior position of the placenta. Furthermore, PT was highly correlated with the increment of maternal BMI.

The placenta highly correlates with both the fetus and mother, serving as a mirror of their status.[22] Therefore, the current study was aimed to find the correlation of PT and GA as well placental position and maternal BMI in every PVTI subgroup to help detect possible risks for fetus and help physicians with delivery schedule. Our findings demonstrated a positive linear relationship between PT and GA, perhaps reflecting two stages in placental growth during pregnancy: one with cellular proliferation up to 36 weeks' gestation and another with cellular hypertrophy from 36 weeks until term.

The placenta itself must also undergo a number of adaptations in order to support the different metabolic needs of the embryo.[23,24] This result is in accordance with those of Prior investigations Adhikari et al.,[17] who found an increase in PT from 11 mm at the 11th gestational week to the 40th gestational week (38.33 mm). In the same way, from 11 to 34 weeks of gestation PT was almost equal to GA, whereas after week 35–40 PT was assumed as being about 1–2 mm less than GA. The other study by Balakrishnan and Virudachalam[13] indicated that PT is a significant factor to predict fetal age, particularly between 25 and 35 weeks of gestation when the PT correlates well with GA; Karthikeyan et al.[25] demonstrated that PT has linear correlation with GA, which is also supported by

many other studies.[5,20,26] However, Ohagwu et al. demonstrated that PT was 45.1 ± 6.4 mm at 39 weeks of gestation, and the authors could not justify why it was higher than in other studies. They suspected that PT might differ in races and be thicker in Negroes.[27] As the previous studies were all cross-sectional, it remains unclear whether PT can serve as an accurate predictor of GA. Thus there is a need for future multi-center, large sample size longitudinal studies to confirm this conclusion.
We also found that the placental location was significantly associated with PT, and the PT in the posterior position was thicker than that in the anterior position. This result is in agreement with Lee et al.[28] reported that posterior placental was about 0.7 cm thicker than anterior placentals. Durnwald and Mercer[29] also found that PT of posterior placentals were significantly higher than anterior placentals in second and third trimester placentographies. In contrast, Hoddick et al. (examined in the same study) detected any links between placental[1] position and PT. This inconsistency is probably related to some technological limitations in the use of ultrasonography in former years. Results[30] In a different section of the result, we noticed that PT also increased with maternal BMI. Ours studies only 2 articles addressed PT in the context of maternal obesity.[29,31] Similar to our studies, Farley et al. 's work also reported 69% higher PT in the obesity baboons.[31,32] However, in Durnwald and Mercer's study BMI of more than 30 kg/m2 did not affect PT.[29] In humans, maternal obesity causes several alterations in the placenta such as: inflammation,[32] increased villitis.,[33] macrophage influx34 increase in placental vascularity[35] and in vascular muscularization of the vessels.[36] In the current study, mechanisms contributing to increase PT seems to be obesity among mothers. As there is little evidence on the impact of maternal BMI in PT, more research in the context of clinical trials will need to clarify this.

CONCLUSION

Finally, our study demonstrated extremes of placental thickness with advancing GA in the first as well as second trimester. In addition, placenta thickness significantly increases in the placental posterior position and a high-BMI woman. We propose placental thickness as a routine measurement in obstetric USGs.

LIMITATIONS OF STUDY

The main limitation of this study was its small sample size. Additional studies with larger sample sizes are highly recommended to assess the causing factors and prevention strategies for control in Pakistan.

ETHICAL APPROVAL:

Ethical approval was taken from the Review Broad of the Mekran Medical College, turbat.

PATIENT'S CONSENT:

Informed written consent was taken from each patients for participating in the study, and publication of study results.

CONFLICT OF INTEREST:

The study has no conflict of interest to declare by any author.

AUTHOR'S CONTRIBUTION:

1. Literature search, conduct of study and editing.
2. Literature search, ethical approval and manuscript writing.
3. Sampling and results writing.
4. Statistics writing.
5. Literature review and discussion editing.
6. Review and editing.

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