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Research Article

CORRELATION OF PLACENTAL THICKNESS WITH GESTATIONAL AGE IN SECOND AND THIRD TRIMESTER OF PREGNANCY USING ULTRASONOGRAPHY

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ABSTRACT

Objectives: The objective of the study was to evaluate correlation between ultrasound-measured placental thickness and gestational age in singleton pregnancies beyond 12 weeks' gestation.

Methods: A cross-sectional observational study was conducted at a tertiary care center over 2 years, involving 120 pregnant women beyond 12 weeks of gestation with singleton pregnancies. Gestational age was first assessed using standard fetal biometric parameters. Placental thickness was measured at the level of the umbilical cord insertion using grayscale ultrasound. It was measured perpendicular to the chorionic and basal plates. Placental location and abnormalities were also recorded. Data analysis was performed using the Statistical Package for the Social Sciences version 23.0. Pearson's correlation coefficient was used to evaluate the relationship between placental thickness and gestational age. For statistical purposes, a $p<0.05$ is considered as statistically significant.

Results: Most placentas were anteriorly located (46.67%), and the majority had normal morphology (84.17%). There was a strong and statistically significant positive correlation between placental thickness and gestational age from 12 to 37 weeks of gestation in singleton pregnancies. In the 12–24 week group (n=58), r=0.9623 ($p<0.0001$), and in the 25–37 week group (n=59), r=0.9892 ($p<0.00001$). Beyond 38 weeks (n=3), placental thickness showed a slight decline, and the correlation was negative (r=−0.7384, p=0.083). However, this correlation was not found to be statistically significant.

Conclusion: Placental thickness correlated positively with gestational age from 12 to 37 weeks. Its utility as a marker for gestational age estimation diminishes beyond 38 weeks. Therefore, placental thickness can be used as reliable adjunct to fetal biometry for GA estimation during the second and third trimesters.

Keywords: Placental thickness, Gestational age, Ultrasonography, Second trimester, Third trimester.

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INTRODUCTION

Precise estimation of gestational age is an important part of optimal obstetric care. It plays an important role in decision-making regarding prenatal interventions, predicting perinatal outcomes, and appropriately timing deliveries [1]. Inaccurate estimation of gestational age can have serious implications, including pre-term labor, inappropriate interventions, and adverse neonatal outcomes such as respiratory distress syndrome, hypoglycemia, and increased neonatal intensive care unit admissions secondary to prematurity. In low-resource settings where early pregnancy dating by ultrasound might not always be available, the challenge of accurately estimating gestational age becomes more pronounced. Traditionally, fetal biometry has been the principal modality for estimating gestational age in the second and third trimesters. However, factors such as intrauterine growth restriction (IUGR), hereditary skeletal dysplasia, and severe oligohydramnios can compromise the accuracy of biometric parameters and make biometry a non-reliable marker for the estimation of gestational age. This makes it important to look for additional methods that are reliable and feasible. One such method, which is being extensively researched, is the measurement of placental thickness via ultrasonography [2].

Placenta not only supports fetal growth and development but also it reflects the gestational age through its morphological characteristics [3]. Its thickness, in particular, has been proposed as a reliable additional marker for estimation of gestational age. There is an increase in placental thickness with advancing gestational age particularly between 12 and 38 weeks. After 38 weeks of gestation, the placental thickness tends to plateau or decline slightly [4]. The rationale is straightforward as the fetus grows, the placenta also increases in size to meet the growing metabolic demands. This physiological correlation makes it possible to use estimation of placental thickness as a marker for estimation of gestational age. Ultrasonography can precisely Kaushal *et al.* (2017) evaluation of placental thickness as a sonological indicator for the estimation of gestational age of fetus in normal singleton pregnancy. International Journal of Research in Medical Sciences, 3 (5), 1213–1218. Measure placental thickness is typically taken at the level of the umbilical cord insertion perpendicular to the chorionic and basal plates [5].

In certain clinical conditions, where fetal biometry may be unreliable, such as in cases of fetal anomalies, multiple gestations, or maternal conditions such as polyhydramnios and obesity the measurement of placental thickness offers an independent parameter for assessing fetal maturity. Abnormalities in fetal head circumference (HC) due to hydrocephalus or craniosynostosis can lead to erroneous gestational age estimation biometric parameters are solely relied upon [6]. Similarly, in scenarios of suboptimal scans due to due to maternal habitus or suboptimal fetal position, biometric measurements might not be feasible or accurate. In such situations, placental thickness serves as a valuable alternative. Moreover, it offers a diagnostic advantage in identifying conditions such as IUGR, preeclampsia, or placental insufficiency when the observed placental thickness may deviate significantly from percentile values corresponding to gestational age [7].

Many studies have showed that there exist a linear relationship between placental growth and fetal age [8]. Notably, these studies

have also reported that there occurs a decline in placental thickness beyond 38 weeks, which may signify placental aging and the onset of senescence [9]. Despite these promising findings, there exists a significant gap in the integration of placental thickness measurement into routine prenatal care [10]. To address this gap, our study aims to evaluate the correlation between placental thickness and gestational age exclusively, in a cohort of pregnant women beyond 12 weeks of gestation.

METHODS

This was a cross-sectional observational study conducted in the Department of Obstetrics and Gynecology at a tertiary care medical institute over a period of 2 years. A total of 120 pregnant women who were beyond 12 weeks of gestation were enrolled in the study. Informed consent was obtained from patients. Since the study was observational and was based on taking placental thickness during routine obstetric ultrasound examination hence ethical clearance was waivered. The data obtained were anonymized to protect the identity of participants. The sample size was calculated on the basis of previous literature indicating a strong correlation between placental thickness and gestational age, with an anticipated correlation coefficient of at least 0.80. Using OpenEpi version 3.0, with an alpha error of 0.05 and 80% power, a minimum sample of 108 subjects was determined to be sufficient to detect a significant correlation. Considering a possible 10% data loss or dropout rate, we included 120 participants to ensure adequate statistical power.

Pregnant women attending the outpatient antenatal clinic and meeting the inclusion criteria were evaluated using standardized ultrasonographic techniques. Gestational age was initially determined by means of fetal biometry parameters. These parameters included HC, biparietal diameter, abdominal circumference, and femur length. These measurements were taken using an ultrasound machine equipped with a convex probe. Although first-trimester crown-rump length (CRL) measurement is the gold-standard for dating, early CRL scans were not universally available in our cohort due to variable timing of the first antenatal visit. After establishing gestational age by biometry, placental thickness was measured at the level of umbilical cord insertion. The placental thickness was measured perpendicular to the chorionic and basal plates. All measurements were performed when the uterus was observed to be at rest avoiding periods of uterine contraction to minimize contraction-induced artifacts. Placental location (anterior, posterior, fundal, or lateral) and any pathologies such as placenta previa, retroplacental hematoma, or abnormal adherence were also noted. All sonographic evaluations were performed by experienced radiologists to minimize inter-observer variability. Agreement between observers was quantified by the two-way random-effects intraclass correlation coefficient (ICC) for absolute agreement, with 95% confidence intervals. ICC values were interpreted as follows: <0.50=poor, 0.50–0.75=moderate, 0.75–0.90=good, and >0.90=excellent reproducibility. Cases with poor ICC were not included in the study.

Data obtained were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences version 23.0. Continuous variables such as placental thickness and gestational age were expressed as mean±standard deviation. Pearson's correlation coefficient was used to assess the relationship between placental thickness and gestational age. A $p<0.05$ was considered statistically significant. Descriptive statistics were used for demographic variables and placental characteristics.

Inclusion criteria

- Pregnant women with singleton pregnancies
- Gestational age >12 weeks as confirmed by fetal biometry
- Patients who gave informed written consent
- Patients attending routine antenatal care at the study institute.

Exclusion criteria

- Multiple gestations
- Pregnancies complicated by diabetes mellitus, preeclampsia, or other severe systemic illnesses
- Placental anomalies (e.g., previa, abruptio, or morbid adherence)
- Cases with congenital anomalies or documented fetal growth restriction
- Unwillingness to participate or incomplete ultrasound data.

RESULTS

The analysis of the correlation of placental thickness with gestational age in the second and third trimesters of pregnancy using ultrasonography showed that the majority of cases were observed in the gestational age group of 25–30 weeks (43.3%). This was followed by 36 cases (30%) in the 31–37 weeks group, 22 cases (18.3%) in the 13–24 weeks group, and the least number of cases i.e., 10 (8.3%), in the 38–42 weeks category (Fig. 1).

The analysis of the placental location among the studied cases showed that the anterior location was the most common (46.67%). This was followed by the posterior location in 39 cases (32.50%) and the fundal location in 13 cases (10.83%). Less frequently, the placenta was located in the right lateral position in 7 cases (5.83%) and in the left lateral position in 5 cases (4.17%) (Table 1).

The analysis of placental abnormalities or variants among the studied cases revealed that the majority of cases had normal placental morphology (84.17%). Among the abnormal findings, a low-lying placenta was the most frequent, which was observed in 8 cases (6.67%). Marginal cord insertion was seen in 5 cases (4.17%). Placenta previa (complete or partial) and circumvallate placenta were each noted in 2 cases (1.67%), while succenturiate lobe and velamentous cord insertion were the least common, with 1 case each (0.83%) (Fig. 2).

The analysis of the correlation between placental thickness and gestational age across the second and third trimesters showed a

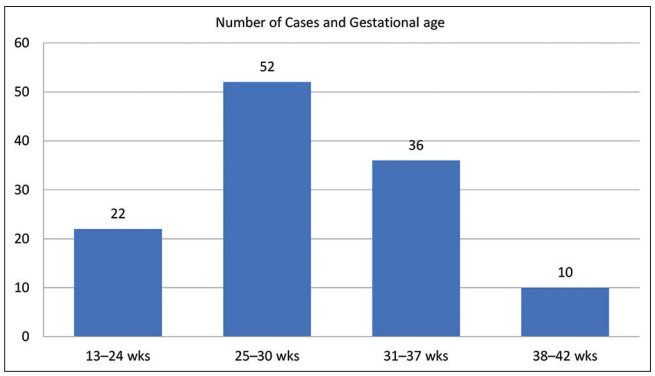

Fig. 1: Distribution of cases on the basis of gestational age

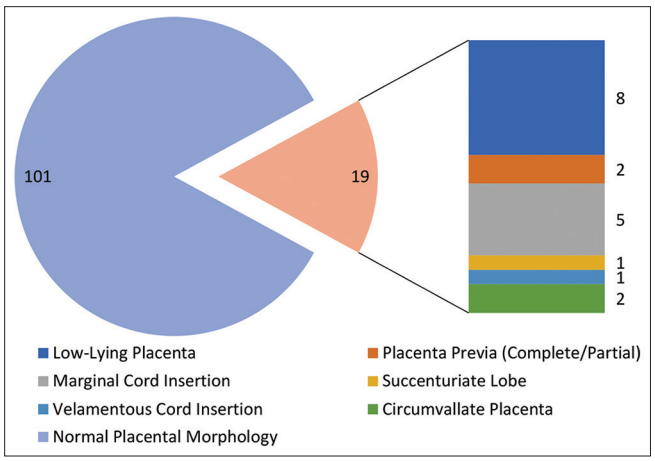

Fig. 2: The analysis of placental abnormalities or variants

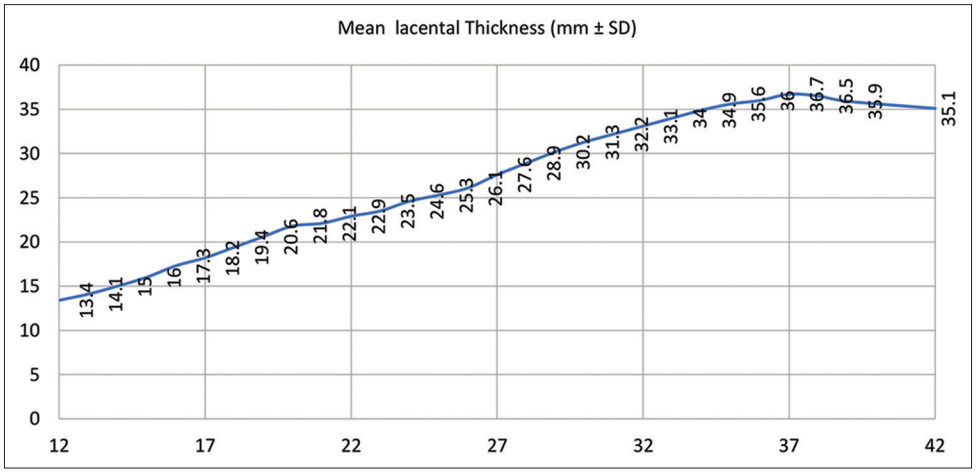

Fig. 3: Scatter diagram of gestational age and placental thickness

Table 1: Distribution of cases on the basis of placental location

Placental location	Number of cases	Percentage
Anterior	56	46.67
Posterior	39	32.50
Fundal	13	10.83
Right lateral	7	5.83
Left lateral	5	4.17
Total	120	100

consistent increase in placental thickness as gestational age increased from 12 to 37 weeks. In the 12–24 weeks group (58 cases) mean placental thickness showed a steady rise from 13.4±0.6 mm at 12 weeks to 24.6±0.8 mm at 24 weeks (r=0.9623, p<0.0001). Similarly, in the 25–37 weeks group (59 cases), placental thickness continued to increase from 25.3±1.0 mm at 25 weeks of gestation to 36.7±0.6 mm at 37 weeks of gestational age. Placental thickness was found to have a statistically significant positive correlation with increasing gestational age (r=0.9892, p<0.00001). However, in the 38–42 weeks group (3 cases) placental thickness slightly decreased from 36.5 mm at 38 weeks to 35.1 mm at 42 weeks. The correlation here was negative (r=–0.7384) and not statistically significant (p=0.083) (Table 2, Fig. 3).

The analysis of the correlation between placental thickness and gestational showed a strong and statistically significant positive relationship during the earlier stages of pregnancy. From 12 to 24 weeks the correlation as assessed by the Pearson correlation coefficient was 0.9623 with a p<0.0001, suggestive of a highly significant positive correlation between placental thickness and gestational age. This trend was found to be stronger in the 25–37 weeks range, where the correlation coefficient was 0.9892 and the p<0.00001, again showing a highly statistically significant relationship. However, in between 38 and 42 weeks of gestational age the correlation became negative (r=–0.7384) and the p=0.083 (statistically not significant) (Table 3).

DISCUSSION

This study involving 120 pregnant women demonstrated a significant positive correlation between placental thickness and gestational age during the second and third trimesters of pregnancy. The correlation coefficients in our analysis (r=0.9623 for 12–24 weeks, r=0.9892 for 25–37 weeks) emphasize the reliability of placental thickness as a marker for estimation of gestational age in case of singleton pregnancies. These findings are similar to those of Afrakhteh *et al*. [11] and Rawal *et al*. [12] who reported statistically significant correlation between placental thickness and gestational age in cohorts of 205 and 298 women, respectively. Our slightly higher coefficients may be attributed to the exclusion of cases of significant placental pathologies and cases of multifetal pregnancies or multiple gestations.

Table 2: Gestational age in weeks and mean placental thickness in study cases

Gestational age (weeks)	Number of cases	Mean placental thickness in mm (mean±SD)
12–24 weeks (r=0.9623, P<0.0001)		
12	3	13.4±0.6
13	3	14.1±0.7
14	4	15.0±0.8
15	4	16.0±0.9
16	4	17.3±1.0
17	4	18.2±1.1
18	5	19.4±0.9
19	5	20.6±0.8
20	5	21.8±0.7
21	5	22.1±0.9
22	5	22.9±0.8
23	5	23.5±0.7
24	5	24.6±0.8
Subtotal	58	
25–37 weeks (r=0.9892, P<0.00001)		
25	5	25.3±1.0
26	5	26.1±0.9
27	5	27.6±0.8
28	5	28.9±1.1
29	5	30.2±0.9
30	5	31.3±1.0
31	4	32.2±1.2
32	4	33.1±0.9
33	4	34.0±1.0
34	4	34.9±0.9
35	4	35.6±0.8
36	4	36.0±0.7
37	4	36.7±0.6
Subtotal	59	
38–42 weeks (r=–0.7384, P=0.083)		
38	1	36.5±0.0
39	1	35.9±0.0
40	0	–
41	0	–
42	1	35.1±0.0
Subtotal	3	
Total	120	

SD: Standard deviation

Within the second-trimester subgroup (12–24 weeks), mean placental thickness in this study ranged from 13.4±0.6 mm to 24.6±0.8 mm. This closely mirrors the patterns observed by Vinchurkar *et al*., who noted a

Table 3: Analysis of correlation between placental thickness and gestational age by Pearson correlation coefficient (r)

Gestational age range (weeks)	Pearson correlation coefficient (r)	p-value	Statistical significance
12–24	0.9623	<0.0001	Highly Significant
25–37	0.9892	<0.00001	Highly Significant
38–42	−0.7384	0.083	Not Statistically Significant

nearly linear increase across similar gestational ranges [13]. However, our study revealed marginally higher thicknesses between 18 and 22 weeks. This could reflect ethnic or regional physiological variations or slight methodological differences.

In the mid-to-late pregnancy period (25–37 weeks), the observed placental growth plateaued with mean thickness near 36.7 mm by week 37. Karthikeyan *et al*. [14] and Pant *et al*. [15] reported comparable values, although their studies showed a slight decline after 35 weeks of gestation. Our findings demonstrated consistent thickness without early decline, likely due to stricter exclusion of growth-restricted fetuses. Past 38 weeks, our study found a mild, non-significant downturn in placental thickness (r=−0.7384, p=0.083). Similar trends were reported by Mathai [16] and Humadi [17], who described placental aging effects manifesting beyond term. This placental aging is thought to affect the strong positive correlation seen between placental thickness and gestational age, which was seen till 37 weeks of gestation.

Omer Ahmed *et al*. conducted a prospective observational study to assess placental thickness as a predictor of gestational age and fetal weight in healthy singleton pregnancies [18]. For this purpose, the authors undertook a study comprising of 210 patients in the second and third trimester. The study found that the mean age of the participants was 24.62±4.12 years, and the mean gestational age was 28.19±6.90 weeks. Placental location was anterior in 47.14%, posterior in 32.38%, and fundal in 10.95% of patients. Mean placental thickness increased from 12.96 mm at 12 weeks to 36.82 mm at 37 weeks, with 36.82 mm determined as the cut-off between pre-term and full-term gestation. There was a strong positive correlation between placental thickness and gestational age from 12 to 38 weeks, and a similarly positive correlation with fetal weight from 14 to 37 weeks. On the basis of these findings, the authors concluded that placental thickness could be used to estimate gestational age and fetal weight in situations where fetal biometry may be unreliable. The findings of the study by Omer Ahmed [18] were similar to our study. Similar findings were also reported by the authors, such as Khajjayam *et al*. [19].

Although we did not study the correlation between abnormalities of placental thickness, many studies reported a significant association between placental thickness abnormalities and abnormal fetal growth, such as IUGR, as well as its association with adverse fetal and neonatal outcomes. Shinde *et al.* [20] and Rafique *et al.* [21] both observed links between abnormal placental measurements and outcomes like fetal growth restriction or hydrops.

We did not adjust our analysis for placental location (anterior vs. posterior). This may influence measured placental thickness due to differential ultrasound attenuation in cases of different placental locations. This limitation may be responsible for systematic variability and should be addressed in future work. Future longitudinal studies could assess how deviations from this baseline may indicate various maternal and fetal pathologies and improve prenatal risk stratification.

Integrating assessment of placental thickness into existing gestational age-estimation protocols will allow crossvalidation of gestational age assignments and will reduce gestational age estimation errors, particularly in situations where fetal biometry cannot be solely relied on. Future work should establish normative placental thickness charts adjusted for maternal and fetal factors to support its use in clinical algorithms.

CONCLUSION

There was a strong and statistically significant positive correlation between placental thickness and gestational age from 12 to 37 weeks; hence, placental thickness can be used as a reliable adjunct to fetal biometry for gestational dating in the second and third trimesters. Given its ease of measurement, reproducibility, and applicability in resource-limited settings placental thickness holds promise as an additional ultrasonographic marker for estimating gestational age.

AUTHORS' CONTRIBUTION

NN- Concept and design of the study, prepared first draft of manuscript, interpreted the results, reviewed the literature, and manuscript preparation; GM- Concept, coordination, statistical analysis and interpretation, preparation of manuscript, and revision of the manuscript. AB- Overall study concept and design; development of clinical protocol; manuscript editing and critical revision.

CONFLICTS OF INTEREST

None.

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REFERENCES

1. Kadam D, Patil S, Jain M. Placental thickness: An important parameter in determining gestational age and fetal growth during ANC scan. Int J Reprod Contracept Obstet Gynecol. 2018;7(11):4619-22.
2. Banik S, Rajkumari A, Devi AJ, Sarkar R, Ayekpam M. Placental thickness measurement by ultrasonography and its correlation with gestational age of fetus in the Manipuri population. Int J Appl Basic Med Res. 2022 Apr-Jun;12(2):117-22. doi: 10.4103/ijabmr.ijabmr_658_21
3. Burton GJ, Fowden AL. The placenta: A multifaceted, transient organ. Philos Trans R Soc Lond B Biol Sci. 2015 Mar 5;370(1663):20140066. doi: 10.1098/rstb.2014.0066
4. Kaushal L, Patil A, Kocherla K. Evaluation of placental thickness as a sonological indicator for estimation of gestational age of foetus in normal singleton pregnancy. Int J Res Med Sci. 2017;3(5):1213-8.
5. Sharami SH, Milani F, Fallah Arzpeyma S, Dalil Heirati SF, Pourhabibi Z. The relationship between placental thickness and gestational age in pregnant women: A cross-sectional study. Health Sci Rep. 2023 Apr 27;6(5):e1228. doi: 10.1002/hsr2.1228
6. Hata T, Tanaka H, Noguchi J, Hata K. Three-dimensional ultrasound evaluation of the placenta. Placenta. 2011 Feb;32(2):105-15. doi: 10.1016/j.placenta.2010.11.001
7. Nagpal K, Mittal P, Grover SB. Role of ultrasonographic placental thickness in prediction of fetal outcome: A prospective Indian study. J Obstet Gynaecol India. 2018 Oct;68(5):349-54. doi: 10.1007/s13224-017-1038-8
8. Azagidi AS, Ibitoye BO, Makinde ON, Idowu BM, Aderibigbe AS. Fetal gestational age determination using ultrasound placental thickness. J Med Ultrasound. 2019 Oct 9;28(1):17-23. doi: 10.4103/JMU.JMU_127_18
9. Rutherford JN, deMartelly VA, Ragsdale HB, Avila JL, Lee NR, Kuzawa CW. Global population variation in placental size and structure: Evidence from Cebu, Philippines. Placenta. 2019 Sep 15;85:40-8. doi: 10.1016/j.placenta.2019.08.076
10. Sun X, Shen J, Wang L. Insights into the role of placenta thickness as a predictive marker of perinatal outcome. J Int Med Res. 2021 Feb;49(2):300060521990969. doi: 10.1177/0300060521990969
11. Afrakhteh M, Moeini A, Sanei Taheri M, Haghighatkhah HR. Correlation between placental thickness in the second and third trimester and fetal weight. Rev Bras Ginecol Obstet. 2013;35(7):317-22.
12. Rawal S, Ray S, Sharma N. Correlation between ultrasonographic placental thickness and adverse fetal and neonatal outcomes. Cureus.

2024 Mar 18;16(3):e56410. doi: 10.7759/cureus.56410

13. Vinchurkar KN, Aiyappan SK, Prem Kumar C, Shanmugam V, Singh A. Correlation of placental thickness with gestational age in second and third trimester using ultrasonography. Egypt J Radiol Nucl Med. 2023;54:164. doi: 10.1186/s43055-023-01112-y
14. Karthikeyan T, Subramaniam RK, Johnson W, Prabhu K. Placental thickness & its correlation to gestational age & foetal growth parameters- a cross sectional ultrasonographic study. J Clin Diagn Res. 2012 Dec;6(10):1732-5. doi: 10.7860/JCDR/2012/4867.2652
15. Pant S, Dashottar S. A correlative study to evaluate the gestational age by sonological measurement of placental thickness in normal second and third trimester of pregnancy. Int J Adv Med. 2017;4(6):1638-44.
16. Mathai BM, Singla SC, Nittala PP, Chakravarti RJ, Toppo JN. Placental thickness: Its correlation with ultrasonographic gestational age in normal and intrauterine growth-retarded pregnancies in the late second and third trimester. J Obstet Gynaecol India. 2013 Aug;63(4):230-3. doi: 10.1007/s13224-012-0316-8
17. Humadi EH, Zghair MA, Kudhire NA. The accuracy of placental thickness in estimation of gestational age during late third trimester - A single centre cross sectional study. J Pak Med Assoc. 2021 Dec;71(Suppl 8)(12):S93-6.
18. Omer Ahmed FA, Ibrahim RM, Farouk AM, Aboushady RM. Assessment of placental thickness as a predictor of gestational age and fetal weight in second and third trimester of pregnancy. Int J Reprod Contracept Obstet Gynecol 2023;12:794-800.
19. Khajjayam A, Sharma J, Kumar A, Patel A, Malik R. Ultrasound evaluation of placental thickness: Insights from an observational study and implications for fetal growth assessment. Cureus. 2024 Jun 20;16(6):e62760. doi: 10.7759/cureus.62760
20. Shinde GR, Kshirsagar N, Laddad M, Shivade V. Ultrasonographic placental thickness versus fetal outcome: A prospective study in Southern India. Caspian J Intern Med. 2021 Fall;12(4):562-7. doi: 10.22088/cjim.12.4.562
21. Rafique Z, Awan MW, Iqbal S, Usmani NN, Ahmad M, Amjad M, Ullah S, et al. The ability of ultrasound sonography (USG) to detect intrauterine growth restriction (IUGR) in the third trimester of pregnancy with the gold standard of IUGR (parameters by USG Hadlock) as a diagnostic criterion. Cureus. 2021 Dec 19;13(12):e20523. doi: 10.7759/cureus.20523