



www.bioinformation.net
Volume 21(2)



Research Article

Received February 1, 2025; Revised February 28, 2025; Accepted February 28, 2025, Published February 28, 2025

DOI: 10.6026/973206300210205

SJIF 2025 (Scientific Journal Impact Factor for 2025) = 8.478

2022 Impact Factor (2023 Clarivate Inc. release) is 1.9

Declaration on Publication Ethics:

The authors state that they adhere with COPE guidelines on publishing ethics as described elsewhere at <https://publicationethics.org/>. The authors also undertake that they are not associated with any other third party (governmental or non-governmental agencies) linking with any form of unethical issues connecting to this publication. The authors also declare that they are not withholding any information that is misleading to the publisher in regard to this article.

Declaration on official E-mail:

The corresponding author declares that lifetime official e-mail from their institution is not available for all authors

License statement:

This is an Open Access article which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly credited. This is distributed under the terms of the Creative Commons Attribution License

Comments from readers:

Articles published in BIOINFORMATION are open for relevant post publication comments and criticisms, which will be published immediately linking to the original article without open access charges. Comments should be concise, coherent and critical in less than 1000 words.

Disclaimer:

Bioinformation provides a platform for scholarly communication of data and information to create knowledge in the Biological/Biomedical domain after adequate peer/editorial reviews and editing entertaining revisions where required. The views and opinions expressed are those of the author(s) and do not reflect the views or opinions of Bioinformation and (or) its publisher Biomedical Informatics. Biomedical Informatics remains neutral and allows authors to specify their address and affiliation details including territory where required.

Edited by P Kanguane

Citation: Singh *et al.* Bioinformation 21(2): 205-209 (2025)

Estimating gestational age using placental thickness and fetal weight

Durgesh Singh¹, Neha Gupta², Pankaj Singh³, Sanjay Singh^{4,*}, Shashi Prabha Singh⁵ & ShriLalRaghudev Ram Singh⁶

¹Department of Anatomy, MaaVindhyavasini Autonomous State Medical College, Mirzapur, Uttar Pradesh, India; ²Department of Anatomy, SMMH Medical College, Saharanpur, Uttar Pradesh, India; ³Department of Anatomy, Saraswati Medical College, Unnao, Uttar Pradesh, India; ⁴Department of Anatomy, Rajshree Medical College Bareilly, Uttar Pradesh, India; ⁵Department of Biochemistry, MaaVindhyavasini Autonomous State Medical College, Mirzapur, Uttar Pradesh, India; ⁶Department of Applied Mathematics The University of Waterloo, Canada; *Corresponding author

Affiliation URL:

<https://mvasmc.edu.in/>

<https://smmhmedicalcollege.com/>

<https://www.saraswatimedical.ac.in/>

<https://www.rajshreemri.in/>

<https://uwaterloo.ca/>

Author contacts:

Durgesh Singh - E - mail: dr.dpsingh84@gmail.com

Neha Gupta - E - mail: nehagupta0240@gmail.com

Pankaj Verma - E - mail: drpankaj0014@gmail.com

Sanjay Singh - E - mail: sanjay.shelly18@gmail.com

ShashiPrabha Singh - E - mail: dr.spsingh084@gmail.com

ShriLal Raghudev Ram Singh - E - mail: slrrsing@uwaterloo.com

Abstract:

The correlation between placental thickness, gestational age and fetal weight across different stages of pregnancy is of interest. Hence, 187 women (11-40 weeks gestation) at Maa Vindhyavasini Autonomous State Medical College and SMMH Medical College in India participated in this study. Results showed that mean placental thickness increased with gestational age (2.083 cm at 11-20 weeks, 2.623 cm at 20-30 weeks and 3.29 cm at 30-40 weeks), while fetal weight also increased (172.05g, 746.67g and 2584.49g, respectively). A strong positive correlation was found between gestational age and both fetal weight and placental thickness, except during early pregnancy (11-21 weeks), with statistical significance at the 5% level. Thus, the correlation between placental thickness, fetal weight and gestational age in 187 pregnant women, showing strong positive correlations, especially in later stages of pregnancy is reported.

Keywords: Gestational age, fetus weight, placenta thickness, ultra-sonographic

Background:

Thickness of placenta of pregnant women appears to be a favourable parameter for estimation of gestational age and fetus weight. From the past studies, it was observed that there is good positive correlation between thickness of placenta and gestational age of women. The measurement of thickness of placenta is a crucial parameter for the estimation of gestational age especially for the 11-20 weeks, 21-30 weeks and 31-40 weeks, where the exact duration of pregnancy is not known and sometimes other sonographic parameters is also become unreliable. In a past study Hafner *et al.* (1998) [1] have reported in their study has been recognized fetuses at risk of growth restriction using second trimester placental volumes measured by three-dimensional ultrasound while in another study conducted by Habib (2002) [2] reported that ultrasonographic measurement of placental diameter and thickness is of prognostic value in identifying the subsequent occurrence of fetal growth restriction. Dare *et al.* (1990) [3] in a study mentioned that fetal weight estimation is an important aspect of obstetric management and is variously carried out by tactile assessment of fetal size, maternal self-estimation [Chauhan *et al.* (1992), Baum *et al.* (2002)] [4-5], birth-weight prediction equation Dare *et al.* (1990) [3] and using algorithm derived from maternal and pregnancy-specific characteristics Nahum (2007) [6]. Therefore, it is of interest to know mean scores of placenta thickness and weight of fetus according to their different gestation periods which is categories in three groups specially (11-20 weeks), (21-30 weeks) and (31-40 weeks), to establish the correlation between thickness of placenta as well as fetus weight and gestation ages of women.

Methods and Materials:

This study was conducted at the Anatomy, Obstetrics & Gynecology and Radiology Department, MaaVindhyavasini

Autonomous State Medical College, Mirzapur, Uttar Pradesh, India and collaboration with SMMH Medical College Saharanpur UP India. The ethical approval was done from the institutional Ethics committee. A total of 187 samples out of 200 were identified for the study purpose. The pregnant women were asked to lay in the supine the thickness of placenta and measured at level of cord insertion. Transducer has been oriented perpendicular to scan both chorionic and basal plates. The measurements of placental thickness have been recorded in centimetres. Each case has been followed up to thrice *i.e.* three times evaluations have been recorded for each case. Ultrasound machine GE Voluson E6 convex probe 3-5 MHz frequency was used and measure placental thickness in Antero-posterior dimension.

Inclusion criteria:

- [1] Patient who was ready to involve in study after informed consent of study.
- [2] Women with 11 to 40 weeks pregnancy.
- [3] Regular menstrual history before current pregnancy.

Exclusion criteria:

- [1] Maternal disease - thyroid disease
- [2] Gestational diabetes
- [3] Hypertension
- [4] Anemia
- [5] Placenta prevails, placental anomalies and poor visualization of placenta
- [6] Multiple pregnancies
- [7] Last menstrual period not known or irregular menstrual period

Statistical analysis:

The data was analyzed using SPSS version 26.0 software. Univariate and bivariate tables were employed to present the findings. Pearson correlation and scatter plots were used to examine the relationship between gestational age, placental thickness and fetal weight. Statistical significance was assessed at the 5% level.

Results:

Gestational age:

In this section, univariate, bivariate and scatter diagram as well as Person correlation coefficient have been used to describe for presentation of the data. **Figure 1** shows that age wise percentage distribution of respondents. Most of the respondents (31%) were belong to age group (<22) years and same percentage were observed for age group (25-30) years. **Table 1** shows that gestational age (11-40 weeks) wise distribution of respondents. Majority of respondents (77.5%) were belonged to gestation age (15-21) week. In case of gestational age (21-31weeks) wise distribution of respondents, majority of respondents (71.7%) were belonged to gestation age (21-24) weeks and followed by 28.3 % for the gestation age (24-31) weeks. Similarly gestational age (31-41 weeks) wise distribution of respondents, majority of respondents (76.5%) were belonged to gestation age (35-41) weeks and followed by 23.5 % for the gestation age (31-35) weeks. **Table 2** indicates that descriptive statistics of thickness of placenta and weight of fetus according different gestation age of respondents. Mean scores of thicknesses of placenta were found 2.08cm, 2.62 cm and 3.29 cm for (11-20), (21-30) and (31-40) weeks respectively. Mean scores of gestation age were found 16 weeks & 6 days, 24 weeks & 5 days and 35 weeks & one days for (11-20), (21-30) and (31-40) weeks of gestation ages respectively. Mean scores of weights of fetus were found 83.95 gm, 367gm and 543.40 gm for (11-20), (21-30) and (31-40) weeks of gestation ages respectively. **Table 3** shows that correlation between Gestation age, thickness of Placenta and weight of fetus (11-20 weeks). It was found that there is very strong positive correlation (0.937) between gestation age and weight of fetus and it was statistically significant at 5 % level of significance whereas correlation between thickness of placenta and gestation age was found almost zero and negative correlation (-0.073). Almost same correlation coefficient (-0.038) was found between thickness of placenta and weight of fetus and it was insignificant at 5 % level of significance. It may be concluded that there was no significant relation between thickness of placenta and gestation age specially (11-20) weeks of respondents. **Table 4** shows that correlation between Gestation age, thickness of Placenta and weight of fetus (21-31 weeks). It was found that there is very strong positive correlation (0.944) between gestation age and weight of fetus and it was statistically significant at 5 % level of significance whereas correlation between thickness of placenta and gestation age was also found positive moderate relation (0.437) and it was found significant at 5% level of significance. Correlation between thickness of placenta and weight of fetus was also found average positive relation (0.430) and it was significant at 5 % level of significance.

Table 5 shows that correlation between Gestation age, thickness of Placenta and weight of fetus (31-41 weeks). It was found that there is very strong positive correlation (0.975) between gestation age and weight of fetus and it was significant at 5 % level of significance whereas correlation between thickness of placenta and gestation age was also found positive average relation (0.519) and almost same correlation (0.521) was observed between thickness of placenta and weight of fetus it was found significant at 5% level of significance. It was observed from the above **Table 4, 5** that correlation among gestation age, thickness of placenta and weight of fetus were increasing as increased of gestation of age except for the gestation age (11-20) weeks of respondents.

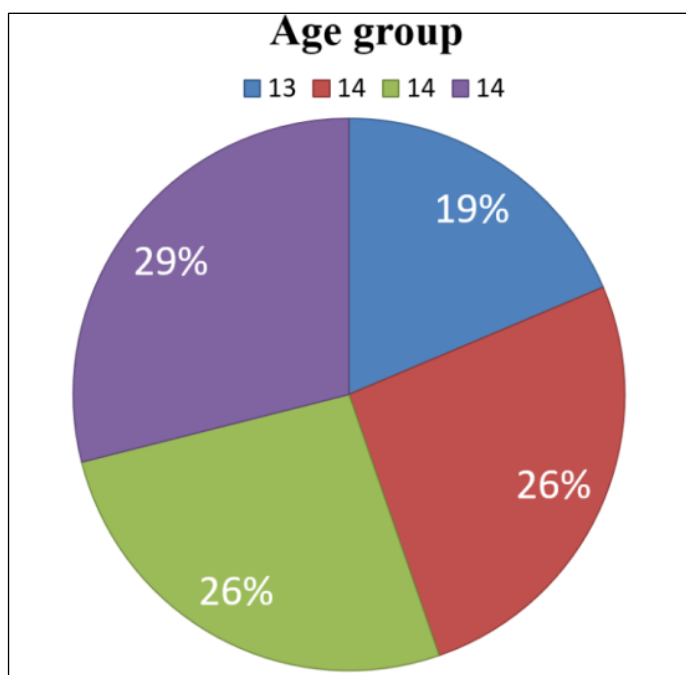


Figure 1: Maternal age groups (in years) of the respondents

Table 1: Gestational age (11-40 weeks) wise distribution of respondents

Gestational age group	Gestational age (week)	Frequency	Percent
1 st group (11-20) weeks	<15	42	22.5
	15-21	145	77.5
2 nd group (21-30) weeks	21-24	134	71.7
	24-31	53	28.3
3 rd group (31-40) weeks	31-35	44	23.5
	35-41	143	76.5
Total		187	100

Table 3: Correlation between gestation age, thickness of placenta and weight of fetus (11-20 weeks)

Gestational age (11-20 weeks)		Gestation age	Thickness of Placenta	Weight of foetus
Gestation age	Pearson Correlation	1	-0.073	.937**
	Sig. (2-tailed)		0.318	0
Thickness of Placenta	Pearson Correlation	-0.073	1	-0.038
	Sig. (2-tailed)	0.318		0.607
Weight of fetus	Pearson Correlation	.937**	-0.038	1
	Sig. (2-tailed)	0	0.607	
N		187	187	187

** Correlation is significant at the 0.01 level (2-tailed).

Table 2: Descriptive statistics of fetus measurement and gestational ages of the respondents

Gestational age group	Variable	Minimum	Maximum	Mean	St. Deviation
11-40 weeks	Gestation age	12.14	21	16.5844	2.209
	Placenta thickness	1.20cm.	3.20cm	2.083 cm	.5666 cm
	Fetus weight	54.00gm	412.0gm	172.0588 gm.	83.9531gm
21-30 weeks	Gestation age	20.14	30.43	24.4905	3.007
	Placenta thickness	2.00cm	4.20cm	2.622cm.	.3465cm
	Fetus weight	21.00gm	1589.0gm	746.6738gm.	367.2240gm
31-40 Weeks	Gestation age	28.57	40.57	35.1245	2.3331
	Placenta thickness	2.00cm	3.91cm	3.290cm.	.2593cm
	Fetus weight	1230gm	4101gm	2584.49 gm.	543.406gm

Table 4: Correlation between gestation age, thickness of placenta and weight of fetus (21-30 weeks)

Gestational Age (21-30 weeks)		Gestation age	Thickness of Placenta	Weight of fetus
Gestation age	Pearson Correlation	1	.437**	.944**
	Sig. (2-tailed)		0	0
Thickness of Placenta	Pearson Correlation	.437**	1	.430**
	Sig. (2-tailed)	0		0
Weight of fetus	Pearson Correlation	.944**	.430**	1
	Sig. (2-tailed)	0	0	
	N	187	187	187

Table 5: Correlation between Gestation age, thickness of Placenta and weight of fetus (31-40 weeks)

Gestational Age (31-40 weeks)		Gestation age	Thickness of Placenta	Weight of fetus .975**
Gestation age	Pearson Correlation	1	.519**	
	Sig. (2-tailed)		0	0
Thickness of Placenta	Pearson Correlation	.519**	1	.521**
	Sig. (2-tailed)	0		0
Weight of fetus	Pearson Correlation	.975**	.521**	1
	Sig. (2-tailed)	0	0	
	N	187	187	187

Discussion:

Placental thickness and fetal weight were recorded across different gestational age groups, specifically 11-20, 20-30 and 30-40 weeks. The discussion in this section is based on the analysis of data and results. Most respondents (31%) fell into the age groups of under 22 years and 25-30 years. The mean placental thickness and fetal weight for the gestational age groups 11-20, 20-30 and 30-40 weeks were 2.083 ± 0.56 cm, 2.623 ± 0.34 cm and 3.29 ± 0.26 cm and 172.05 ± 83.95 g, 746.67 ± 367.22 g and 2584.49 ± 543.41 g, respectively. A strong positive correlation was observed between fetal weight and gestational age. For gestational age 11-20 weeks, the correlation between gestational age and fetal weight was very strong (0.937) and statistically significant at the 5% level. This finding aligns with a similar study by Karthikeyan *et al.* (2012) [7]. However, no significant correlation was observed between placental thickness and fetal weight for this gestational age group. In a study by Banik *et al.* (2022) [8], an ultra-sonographic analysis of placental maturity showed that placental thickness was roughly equivalent to gestational age. For gestational age 20-30 weeks, a strong positive correlation (0.944) was found between gestational age and fetal weight, which was statistically significant at the 5% level. The correlation between placental thickness and gestational age was moderate (0.437), also significant at the 5% level. These findings are consistent with previous studies, such as those by Karthikeyan *et al.* (2012) [7], Larcher *et al.* (2023) [9] and Rawal *et al.* (2024) [10]. For gestational age 31-40 weeks, a strong positive correlation (0.975) was found between gestational age and fetal weight, significant at the 5% level. The correlation between placental thickness and gestational age was

good (0.519), with a similar correlation (0.521) observed between placental thickness and fetal weight, both significant at the 5% level. These results are consistent with a study by Mathai *et al.* (2013) [11]. Vinchurkar *et al.* (2023) Placental thickness is closely associated with fetal weight during gestation. Regular measurement of placental thickness can assist in estimating gestational age and identifying babies with intrauterine growth restriction (small for gestational age) [12]. Tables 3, 4 and 5 the correlations between gestational age, placental thickness and fetal weight increased with gestational age, except for the 11-20-week group. This variation may be attributed to data collection during the COVID-19 pandemic. The study was based on a small sample and placental thickness and fetal weight were measured for gestational ages ranging from 11-40 weeks. A larger sample size with a longitudinal study design would provide more accurate measurements of placental thickness and could help predict the exact delivery date for pregnant women. There is a significant positive correlation between placental thickness and fetal weight, making the measurement of placental thickness at the umbilical cord insertion site a dependable sonographic predictor of fetal weight [13].

Conclusion:

A strong, positive correlation was observed between placental thickness and gestational age, with placental thickness consistently increasing throughout pregnancy. Fetal weight also followed a predictable growth pattern, aligning with established gestational age markers. Combining these two measurements offers a non-invasive, effective method for gestational age estimation, especially in cases where traditional methods, such

as last menstrual period or early pregnancy ultrasound, are unavailable or unreliable. Thus, the strong correlation between placental thickness and fetal weight provides promising alternatives for accurate gestational age estimation, potentially improving prenatal care in challenging clinical situations.

References:

- [1] Hafner E *et al.* *Ultrasound Obstet Gynecol.* 1998 **12**:97. [PMID: 9744052]
- [2] Habib FA. *Ann Saudi Med.* 2002 **22**:312. [PMID: 17146250]
- [3] Dare FO *et al.* *Int J Gynaecol Obstet.* 1990 **31**:243. [PMID: 1969365]
- [4] Chauhan SP *et al.* *Obstet Gynecol.* 1992 **79**: 956. [PMID: 1579321]
- [5] Baum JD *et al.* *J Reprod Med.* 2002 **47**:194. [PMID: 11933683]
- [6] Eze CU *et al.* *Afr Health Sci.* 2015 **15**:1112. [PMID: 26958011]
- [7] Karthikeyan T *et al.* *J ClinDiagn Res.* 2012 **6**:1732. [PMID: 23373039]
- [8] Banik S *et al.* *Int J Appl Basic Med Res.* 2022 **12**:117. [PMID: 35754668]
- [9] Larcher L *et al.* *Placenta.* 2023 **131**:58. [PMID: 36493624]
- [10] Rawal S *et al.* *Cureus.* 2024 **16**:e56410. [PMID: 38638712]
- [11] Mathai BM *et al.* *J ObstetGynaecol India.* 2013 **63**:230. [PMID: 24431647]
- [12] Vinchurkar KN *et al.* *Egypt J RadiolNucl Med* 2023 **54**:164. [DOI:10.1186/s43055-023-01112-y]
- [13] Ali SA *et al.* *Al-Azhar International Medical Journal.* 2023 **4**: 128. [DOI: 10.58675/2682-339X.1909]