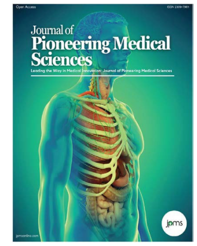
Journal of Pioneering Medical Sciences
Received: December 31, 2025 | Accepted: June 01, 2026 | Published: June 05, 2026
Volume 15, Issue 05, Pages 103-109

DOI https://doi.org/10.47310/jpms2026150514



Prenatal Ultrasonographic Reference Values of Fetal Transcerebellar Diameter

N. Padmalatha[1*], N. Paarthipan[2] and A. Parthasarathi[3]

[1]Department of Anatomy, Saveetha Institute of Medical and Technical Sciences, Chennai, 602105, Tamil Nadu, India
[2]Department of Radiology, Saveetha Institute of Medical and Technical Sciences, Chennai, 602105, Tamil Nadu, India
[3]Department of Radiology, Raja Rajeswari Medical College & Hospital, Bangalore, Dr MG R educational research institute deemed to be university Chennai, India

Author Designation: [1]Research Scholar, [2,3]Professor

*Corresponding author: N. Padmalatha (e-mail: padmalathanarala@gmail.com).

Abstract **Introduction:** Transcerebellar diameter (TCD) is a significant ultrasound parameter to estimate gestational age (GA). Development of the cerebellum is evident in the second trimester in the posterior cranial fossa. TCD is believed to be reliable especially in cases where GA cannot be reliably established by the time of the last menstrual period or early scans and it helps in the evaluation of fetal brain development. **Aim:** To determine ultrasonographic appearances of the fetal cerebellum with advancing GA, establish reference values of TCD between 19 to 35 weeks and compare TCD to cerebellar vermis and biparietal diameter (BPD) to predict GA. **Methods:** A hospital-based cross-sectional study was conducted among 260 pregnant women with gestational ages ranging from 19-35 weeks attending the antenatal clinic. Inclusion criteria included known Last Menstrual Period (LMP) confirmed by first-trimester ultrasonography and intact membranes. Standard fetal biometric parameters such as biparietal diameter (BPD), Head Circumference (HC), Abdominal Circumference (AC) and Estimated Fetal Weight (EFW) were measured. Axial sections of the fetal posterior fossa were used to determine transcerebellar diameter (TCD) and cerebellar vermian dimensions. Correlation and regression analyses were performed using SPSS version 22.0. **Results:** The mean gestational age was 23.98 weeks. The mean TCD, BPD, vermian craniocaudal (CC) and anteroposterior (AP) diameters were 26.2, 58.52, 11.92 and 7.81 mm, respectively. Significant positive correlations were observed between TCD and gestational age ($r = 0.971$), BPD ($r = 0.953$), vermian CC diameter ($r = 0.952$) and vermian AP diameter ($r = 0.899$). Regression analysis demonstrated significant linear relationships, with TCD showing the strongest association with gestational age ($R^2 = 0.943$), followed by vermian CC diameter ($R^2 = 0.906$) and vermian AP diameter ($R^2 = 0.808$). **Conclusion:** TCD and cerebellar vermian measurements showed strong positive correlations with gestational age and may serve as reliable reference parameters for fetal age estimation and assessment of cerebellar growth. Among these parameters, TCD demonstrated better predictive accuracy for gestational age than vermian AP diameter.

Key Words Fetal Trans Cerebellar Diameter, Ultrasonography, Biparietal Diameter, Cerebellar Vermis, Nomogram, Gestational Age

INTRODUCTION

The cerebellum is a portion of the hindbrain located in the dorsal part of the fourth ventricle between the cerebellum and the medulla and pons. The thick occipital bone as well as the dense petrous ridges of the temporal bone effectively shield it. It is divided by the tentorium cerebelli, a dura mater fold, separating it with the cerebral hemispheres. The cerebellum is formed anatomically of two lateral hemispheres and a midline structure, the vermis. It is formed on the dorsolateral part of the alar plate of the metencephalon in the fifth week of intrauterine existence [1].

Fetal gestational age assessment is an important part of obstetric ultrasonography as it helps assess the fetal growth and provide clinical management. The Transverse Cerebellar Diameter (TCD) has become another parameter that is reliable when it comes to this purpose. The cerebellum of the fetus proceeds to grow during pregnancy and its growth can be ultrasonographically assessed at different stages of pregnancy. The cerebellum is less prone to the external compression due to its position on a rigid bony fossa. As a result, the development of conditions like intrauterine growth restriction or macrosomia have little influence on its development [2]. This renders TCD a reliable parameter to estimate gestational age. Research has shown that in normal pregnancies, there is a high correlation between fetal growth indices and TCD. As a non-invasive technique, costeffective and highly available, ultrasonography (USG) enables the clear visualization of the fetal cerebellum, which further supports the use of TCD as a reliable marker [3].

Ultrasonography has greatly enhanced the prenatal diagnosis of congenital anomalies and the evaluation of fetal growth and development. Although ultrasound biometry is very accurate in the first and second trimester, its accuracy decreases during the third trimester. At this stage dependence on one parameter is not enough and more measurements are advised to be able to estimate [4].

In most environments particularly resource constrained areas pregnant women tend to make their first antenatal visit during the third trimester due to socioeconomic factors. Most of them might not know when their last menstrual day was or they may not have used any early dating scans, so it is difficult to determine gestational age. Consequently, pregnancies might be wrongly termed as preterm or post-term [5]. Past researches suggest that most of the biometric parameters, including BPD, FL, AC and HC, may be affected by the abnormal growth of the fetus but not TCD [6].

The transverse cerebellar distance is the distance between the lateral cerebellar margins of the cerebellar hemispheres excluding the vermis in the midplane. Its safeguarded anatomy in the posterior cranial fossa makes it less susceptible to changes brought about by growth disturbances [7]. Many studies have also confirmed that TCD correlates strongly with gestational age and therefore can be used as a reliable parameter to estimate fetal age [8-10].

Aim

The study aimed to determine ultrasonographic appearances of the fetal cerebellum with advancing GA, establish reference values of TCD between 19-35 weeks and compare TCD to cerebellar vermis and biparietal diameter (BPD) to predict Gestational age.

METHODS

This cross-sectional study included 260 pregnant women who attended the radiology department for routine antenatal ultrasonography between 19 and 35 weeks of gestation. The study was conducted among singleton low-risk pregnancies from January 2021 to December 2023 at selected hospital.

Criteria

The study included pregnant women with uncomplicated singleton pregnancies between 19 and 35 weeks of gestation. Gestational age was established based on the last menstrual period and further verified through first-trimester ultrasonography. Only cases with fetal biometric parameters, such as estimated fetal weight and biparietal diameter, consistent with gestational age were considered. Participants were excluded if there was uncertainty in gestational dating, presence of fetal anomalies, maternal comorbidities such as diabetes mellitus or pregnancy-induced hypertension/preeclampsia, confirmed chromosomal or structural abnormalities or clinical suspicion of intrauterine growth restriction.

Sample Size Calculation

The sample size was determined based on an anticipated minimum correlation coefficient of 0.3, representing a moderate effect size according to Cohen's classification. With a statistical power of 90% and a significance level of 1%, the initial sample size requirement was calculated to be 222 participants. To compensate for a possible attrition rate of 15%, the final sample size was adjusted to 260. The calculation was carried out using SigmaPlot version 14.5.

Study Procedure

Ultrasonographic examinations were performed transabdominally with the participant in a supine position using Samsung RS80A and Siemens Acuson Juniper machines equipped with 1.5 MHz transducers. The posterior cranial fossa of the fetal brain was specifically evaluated to obtain measurements of the transcerebellar diameter (TCD), as well as the craniocaudal and anteroposterior diameters of the cerebellar vermis, along with the biparietal diameter (BPD) [11-13]. All measurements were recorded in millimeters by a single radiologist to minimize inter-observer variability. Standard protocols were followed to assess fetal position, BPD, head circumference, abdominal circumference, femur length and estimated fetal body weight. For TCD measurement, the standard trans-thalamic plane used for BPD assessment was first identified. By slightly angling the probe inferiorly toward the fetal neck, the posterior horns of the lateral ventricles were replaced by the cerebellum. The TCD was measured at the widest diameter, perpendicular to the long axis of the cerebellum. The cerebellar vermis craniocaudal and anteroposterior diameters were measured in the axial plane at the level of the thalamus, where the vermis appeared as an echogenic structure between the two cerebellar hemispheres.

Ethical Consideration

Ethical approval for the study was obtained from the Institutional Ethics Committee of Rajarajeswari Medical College (Approval No. RRMCH-IEC/178/2019-20).

Statistical Analysis

All the statistical tests were conducted with the help of SPSS software, Version 22.0. Pearson correlation coefficients were obtained to test the strength of the linear relationship between each of the transcerebellar diameter and GA, BPD, cerebellar vermis craniocaudal and anteroposterior diameters of the cerebellum. The calculation of Linear Regressions was done. The statistical tests level of significance was taken as 1% (p 0.01). The regression equation was plotted between transcerebellar diameter and GA The linear regression lines were also plotted between TCD and biparietal diameter.

RESULTS

A total of 260 fetuses between 19 and 35 weeks of gestation were included in the study. The mean gestational age was 23.98±3.95 and 23.98±3.95 weeks. The

Table 1: Descriptive Data

Parameter	Mean	SD
Gestational Age in weeks	23.98	3.95
Transcerebellar Diameter in mm	26.2	5.62
Biparietal Diameter in mm	58.52	11.42
Cerebellar vermis craniocaudal length in mm	11.92	2.74
Cerebellar vermis anteroposterior diameter in mm	7.81	2.53

Table 2: Showing Correlation and Regression of Transcerebellar Diameter with GA, BPD.CV-CC, CV-AP

Parameters compared	Correlation		Regression (y)	Regression Coefficient (R^2)
	r-value	p-value		
TCD vs. GA	r = 0.971	p<0.001	-6.913+(1.381×GA (weeks)	0.943
TCD vs. BPD	r = 0.953	p<0.001	-1.179+(0.468×BPD (mm)	0.908
TCD vs. CV-CC	r = 0.952	p<0.001	2.875+1.956×CV-CC (mm)	0.906
TCD vs. CV-AP	r = 0.899	p<0.001	10.602+1.997×CV-AP (mm)	0.808

Table 3: Mean and SD of Trans Cerebellar Diameter, Biparietal Diameter, Cerebellar Vermis Craniocaudal and Anteroposterior Diameters (mm) for Each Gestational Age

Gestational age (weeks)	Number	TCD		BPD		CV-CC		CV-AP	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
19	8	19.0	0.9	1.29	0.48	7.4	0.3	5.6	0.2
20	28	20.1	1.0	2.73	0.51	8.4	0.3	6.2	0.2
21	46	21.5	1.0	2.365	0.34	9.3	0.3	6.23	0.3
22	38	23.4	0.8	2.369	0.38	11.5	0.3	6.7	0.2
23	42	25.0	0.8	2.31	0.35	12.3	0.3	7.0	0.2
24	10	26.2	0.4	0.78	0.24	12.1	0.2	7.0	0.1
25	16	28.1	0.3	2.30	0.57	12.9	0.3	7.4	0.3
26	20	29.9	0.9	2.39	0.53	13.1	0.3	7.8	0.6
27	9	33.0	0.9	1.69	0.56	13.6	0.4	8.5	0.5
28	5	33.6	0.5	2.38	1.06	14.5	0.4	9.8	0.4
29	7	34.6	0.5	2.05	0.77	15.5	0.5	11.5	0.4
30	7	35.9	0.7	3.35	1.26	15.6	0.4	11.6	0.3
31	3	36.3	0.67	2.30	1.33	16.3	0.5	12.7	0.3
32	5	37.4	0.5	2.302	1.030	17.5	0.2	13.9	0.1
33	3	38.3	0.6	1.155	0.667	17.6	0.2	14.1	0.1
34	8	37.0	1.9	0.926	0.327	17.7	0.5	14.8	0.6
35	5	38.2	0.8	0.447	0.200	18.4	0.2	16.1	0.2

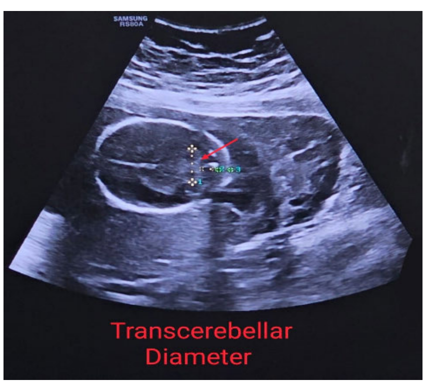


Figure 1: TCD in Axial Plane (Projection Arrow) at 27 Weeks of GA

average measurements recorded were as follows: Transcerebellar distance (TCD) 26.2±5.62 and 26.2±5.62 mm, biparietal diameter (BPD) 58.52±11.42 and 58.52±11.42 mm, cerebellar vermis craniocaudal (CV-CC) length 11.92±2.74 and 11.92±2.74 mm and cerebellar vermis anteroposterior (CV-AP) diameter 7.81±2.53 and 7.81±2.53 mm (Table 1).

Pearson correlation analysis demonstrated strong positive associations between TCD and gestational age (r = 0.971, p<0.001, r = 0.971, p<0.001), BPD (r = 0.953, p<0.001, r = 0.953, p<0.001), CV-CC (r = 0.952, p<0.001, r = 0.952, p<0.001) and CV-AP (r = 0.899, p<0.001, r = 0.899, p<0.001). These findings indicate statistically significant linear relationships between TCD and the evaluated fetal biometric parameters (Table 2).

Linear regression analysis further confirmed these relationships. The regression equation describing TCD in relation to gestational age was y = -6.913+1.381×GA, with a high coefficient of determination (R^2 = 0.943, p<0.001). Comparable regression models were obtained for TCD with BPD (y = -1.179+0.468×BPD; R^2 = 0.908), CV-CC (y = 2.875+1.956×CV-CC; R^2 = 0.906) and CV-AP (y = 10.602+1.997×CV-AP; R^2 = 0.808), all showing strong statistical significance (p<0.001) (Table 2).

The mean and standard deviation values of TCD, BPD, CV-CC and CV-AP across gestational ages from 19-35 weeks are summarized in Table 3, demonstrating a consistent increase with advancing gestation. Percentile distributions (10th, 25th, 50th, 75th and 90th percentiles) for TCD and BPD are presented in Table 4, while those for CV-CC and CV-AP are shown in Table 5. Scatter plots illustrate clear linear trends between TCD and gestational age, as well as with BPD, CV-CC and CV-AP.

Figure 1 demonstrates the measurement of transcerebellar diameter (TCD) in the axial plane at 27 weeks of gestation. The cerebellum is visualized within the posterior cranial

Table 4: Nomogram Showing Mean-Trans Cerebellar Diameter, Biparietal Diameter, (mm) for Each Gestational Age

Gestational age (weeks)	Number	TCD -Percentiles					BPD - Percentiles				
		10	25	50	75	90	10	25	50	75	90
19	8	18	18	19	20	20	43	44	45	46	47
20	28	19.7	20	20	21	21	44	45	47	50	51
21	46	19.7	21	22	22	22	46	47	49	52	52
22	38	22	23	24	24	24	49	49	53	54	55
23	42	25	25	25	25	26	54	55	57	59	60
24	10	26	26	26	26.3	27	60	60	61	62	62
25	16	28	28	28	28	29	58	62	64	64	66
26	20	29	29	30	31	31	59	59	64	64	64
27	9	32	32	33	34	34	66	68	69	70	72
28	5	33	33	34	34	34	67	68	72	72	73
29	7	34	34	35	35	35	69	70	73	74	74
30	7	35	35	36	36	37	70	74	76	78	80
31	3	36	36	36	37	37	72	72	72	76	76
32	5	37	37	37	38	38	78	79	81	83	84
33	3	38	38	38	39	39	82	82	84	84	84
34	8	36	36	36	39	40	86	86	88	88	88
35	5	37	37.5	38	39	39	87	87	87	87	88

Table 5: Nomogram Showing Mean Cerebellar Vermis Craniocaudal and Anteroposterior Diameters (mm) for Each Gestational Age

Gestational age (weeks)	Number	CV-CC -Percentiles					CV-AP - Percentiles				
		10	25	50	75	90	10	25	50	75	90
19	8	7	7.1	7.1	7.7	7.9	5.4	5.4	5.5	5.8	5.9
20	28	8	8.2	8.4	8.6	8.8	6	6	6.2	6.4	6.4
21	46	8.9	9	9.3	9.6	9.8	5.7	6	6.2	6.5	6.5
22	38	11.1	11.2	11.4	11.6	11.8	6.6	6	6.6	6.8	7
23	42	11.8	12	12.3	12.5	12.8	6.8	6.9	7	7.1	7.2
24	10	11.8	11.9	12	12.2	12.3	6.9	6.9	6.9	7.05	7.2
25	16	12.4	12.6	13	13	13.4	7.2	7.2	7.3	7.5	8.2
26	20	12.8	12.8	13.1	13.5	13.6	6.9	7.1	7.8	8.4	8.4
27	9	13	13.4	13.6	13.9	14.2	7.8	8.05	8.6	8.9	9.2
28	5	14	14.1	14.5	14.8	14.8	9.3	9.4	9.9	10.1	10.2
29	7	14.8	15.2	15.4	16	16.1	10.9	11.4	11.5	11.8	12
30	7	15	15.2	15.8	15.8	16	11.2	11.2	11.6	11.8	12
31	3	15.8	15.8	16.4	16.8	16.8	12.4	12.4	12.7	12.9	12.9
32	5	17.2	17.3	17.6	17.7	17.7	13.8	13.8	14	14.05	14.1
33	3	17.4	17.4	17.6	17.8	17.8	14.0	14	14	14.2	14.2
34	8	17	17.2	17.8	18.1	18.4	14.1	14.1	14.7	15.3	15.7
35	5	18.3	18.3	18.3	18.6	18.8	15.9	15.9	16	16.2	16.3

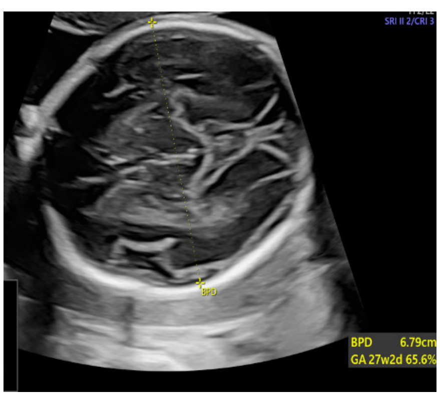


Figure 2: BPD at 27 Weeks of GA

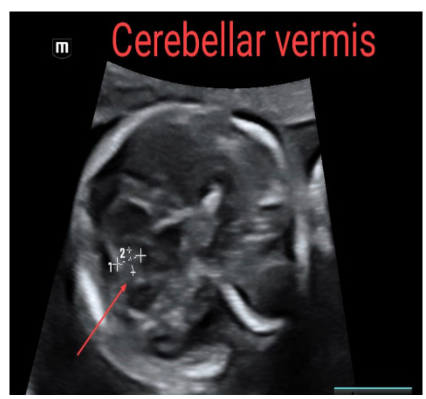


Figure 3: Cerebellar Vermis Anteroposterior Diameter (1) and Craniocaudal Length (2) in Axial Plane

fossa and the measurement is taken between the outer margins of the cerebellar hemispheres, following standard practice.

Figure 2 illustrates the measurement of biparietal diameter (BPD) at 27 weeks of gestation. This is obtained in the axial plane at the level of the thalami and cavum septi pellucidi, extending from the outer edge of the proximal skull table to the inner edge of the distal skull table.

Figure 3 shows cerebellar vermis measurements in the axial plane at 27 weeks of gestation. The anteroposterior diameter and craniocaudal length of the vermis are depicted, demonstrating the standard method used to evaluate vermian development.

DISCUSSION

Accurate assessment of gestational age is essential for ensuring appropriate antenatal care and improving pregnancy outcomes. Although various fetal biometric parameters are widely used for this purpose, their reliability may be affected in conditions associated with abnormal fetal growth patterns. During ultrasonographic examination, the fetal cerebellum appears in the posterior cranial fossa as two symmetrical hemispheres situated on either side of the midline and connected by the cerebellar vermis. This characteristic “butterfly” or “dumbbell-shaped” configuration is best visualized in the transverse cerebellar plane and is commonly utilized for measuring the transcerebellar diameter (TCD) [15-17].

The transcerebellar diameter is considered a dependable parameter for estimating gestational age because the posterior cranial fossa is relatively resistant to deformation caused by external pressure during ultrasound imaging. Consequently, TCD offers a more consistent and accurate estimation of gestational age compared to biparietal diameter, particularly in situations where cranial shape abnormalities such as brachycephaly or dolichocephaly are present [18,19].

Fetal studies have demonstrated a strong correlation between transcerebellar diameter (TCD) and Gestational Age (GA), with TCD showing a near-linear increase particularly during the second trimester. This predictable growth pattern makes TCD a reliable parameter for estimating gestational age [8,9,20]. The data from neonatal studies have also confirmed that the transcerebellar diameter (TCD) continues to increase with Gestational Age (GA) in a linear fashion, particularly over the range of approximately 23 to 32±6 weeks [18,21,22].

The present study demonstrates a strong and statistically significant positive correlation between transcerebellar diameter (TCD) and Gestational Age (GA) ($r = 0.971$; $p<0.001$), indicating that TCD increases in a near-linear fashion with advancing gestation. The results of current study are in close agreement with recent studies that have consistently reported a high degree of correlation ($r>0.9$) between TCD and GA, reaffirming its reliability as a biometric parameter in fetal age estimation [8,15,17,20]. Uzair et al observed a strong linear relationship ($r \approx 0.94$), comparable to conventional parameters such as biparietal diameter (BPD), Femur Length (FL) and Abdominal Circumference (AC). Recent longitudinal studies of Abonyi et al further support the consistent growth pattern of the cerebellum across gestation, making TCD a dependable parameter even when menstrual dating is uncertain. Importantly, TCD has been shown to be less affected by fetal growth disturbances due to the brain-sparing phenomenon. Studies by Mumtaz *et al.* [25] and others have demonstrated that TCD maintains a strong correlation with GA even in intrauterine growth restriction (IUGR), where traditional parameters like BPD and AC may underestimate gestational age [23-25].

The recent comparative studies have demonstrated that transcerebellar diameter (TCD) is a more reliable parameter than biparietal diameter (BPD) for estimating gestational age, particularly in the third trimester. Ali et al reported a stronger correlation of TCD with gestational age ($r = 0.98$) compared to BPD ($r = 0.87$), with higher accuracy (93.6% vs. 79.9%). Furthermore, Bekele et al confirmed that TCD is superior to conventional biometric parameters, including BPD, in late gestation. This improved reliability is attributed to the relative resistance of cerebellar growth to external factors such as fetal head molding and growth restriction, unlike BPD, which is influenced by skull shape variations. Therefore, TCD serves as a more dependable parameter for gestational age estimation, especially when conventional indices are unreliable [26,27]. The present study, in addition to GA, TCD showed a strong positive correlation with biparietal diameter (BPD) ($r = 0.953$).

In the current study the transcerebellar diameter had also showed a linear corelation with vermian craniocaudal diameter ($r = 0.952$) and vermian anteroposterior diameter ($r = 0.899$), all of which were statistically significant ($p<0.001$). These results suggest that cerebellar growth parallels overall fetal cranial and posterior fossa development. Similar observations have been reported in recent studies, where TCD demonstrated high concordance with other fetal biometric indices, reinforcing its clinical utility as an adjunct or alternative parameter when conventional indices are unreliable [19].

The derived regression equations in the present study further validate these relationships. The linear regression model between GA and TCD ($y = -6.913+1.381\times GA$) highlights a steady increment in TCD with gestational age progression. Comparable regression models have been documented in contemporary studies, confirming that TCD can reliably predict GA with minimal deviation, even in cases where head shape abnormalities affect measurements like BPD [22,28]. Significantly, compared to other metrics, the association between TCD and vermian anteroposterior diameter is comparatively lower ($r = 0.899$). This could be due to differing growth dynamics within the cerebellum, where hemispheric expansion (as measured by TCD) is more uniform than vermian dimensional changes. This finding is consistent with research on prenatal neurodevelopment that shows cerebellar hemispheres expand more steadily than midline regions [29].

The establishment of reference values and percentile-based nomograms (10th, 25th, 50th, 75th and 90th percentiles) across 19-35 weeks enhances the clinical applicability of the present data. Such nomograms are essential for distinguishing normal from abnormal growth patterns and have been emphasized in recent obstetric imaging guidelines as critical tools for fetal surveillance [28].

Comparative studies evaluating transcerebellar diameter (TCD) and cerebellar vermis dimensions demonstrate that all three parameters-TCD, vermis craniocaudal (CC) and anteroposterior (AP) diameters-show a progressive increase with advancing gestational age. However, TCD exhibits a more consistent and linear growth pattern, making it a more reliable parameter for gestational age estimation. Quantitative analyses have shown that while vermian CC and AP diameters correlate with gestational age, they are relatively smaller and demonstrate greater variability compared to TCD. Furthermore, vermis measurements require precise midsagittal visualization, making them technically more demanding and operator dependent. In contrast, TCD can be easily obtained in the axial plane with high reproducibility. Studies have also highlighted that vermian dimensions are particularly useful in detecting posterior fossa abnormalities, whereas TCD serves as a robust primary parameter for gestational age estimation. Therefore, TCD is considered superior for routine dating, while vermis measurements function as complementary indices, especially in the evaluation of cerebellar anomalies [30,31].

Hence the results of the present study show that TCD is a clinically accurate, reliable and dependable parameter for determining gestational age. Its linear growth pattern and excellent correlation to GA and other biometric parameters suggest its common application in obstetric ultrasonography, especially when conventional parameters are inadequate.

CONCLUSIONS

Ultrasonographic biometry of the foetal TCD, BPD, cerebellar vermis craniocaudal and anteroposterior diameters have been shown to strongly correlate with progressing GA and other biometric parameters that have been routinely assessed. These results provide normative ranges of reference of transcerebellar diameter, craniocaudal and anteroposterior diameter of cerebellar vermis during 19-35 gestation weeks. Subsequent research needs to be done to ensure that these ultrasounds obtained nomograms are confirmed by comparing them with MRI based biometry of TCD, craniocaudal and anteroposterior diameters of cerebellar vermis.

Limitations

After assessing the current study, a number of limitations should be taken into account. The research fails to observe the changes over time in the same fetus since it is a cross-sectional study. All of the imaging interpretations were provided by one radiologist which could have resulted in bias. We in the present study used ultrasonography as only, however, it is not as precise as MRI in assessing complex brain structures. Moreover, the applicability of the study to other gestational periods was small since the study focused on foetuses that were between 19 and 35 weeks. Variables such as fetal position, maternal obesity may have had an effect on measurements but they were not considered in full.

REFERENCES

[1] Moore, K.L. *et al. The Developing Human: Clinically Oriented Embryology.* 12th Ed., Elsevier, 2023.
[2] Peñuelas, N. *et al.* "Gestational Age Assessment by Ultrasound Cerebellar Measurements in Fetal and Perinatal Deaths." *American Journal of Obstetrics and Gynecology*, vol. 232, 2025, pp. 559.e1-559.e10.
[3] Gareeballah, A. *et al.* "Accuracy of Transverse Cerebellar Diameter in Estimating Gestational Age in the Second and Third Trimester." *Diagnostics*, vol. 15, no. 9, 2025.
[4] Chukwuemeka, A.C. *et al.* "Accuracy of Ultrasound Estimation of Gestational Age in Late Pregnancy: A Comparative Study of Biometric Parameters." *BMC Pregnancy and Childbirth*, vol. 22, 202.
[5] Yadav, M. *et al.* "Factors Associated with Late Gestational Age of Diagnosis and Delayed Referral in Pregnancy." *Prenatal Diagnosis*, vol. 43, no. 11, 2023, pp. 1406-1415.
[6] Singh, J. *et al.* "Utility of Sonographic Transcerebellar Diameter in the Assessment of Gestational Age in Normal and Intrauterine Growth-retarded Fetuses." *Nigerian Journal of Clinical Practice*, vol. 25, no. 2, 2022, pp. 167-172.
[7] Tonni, G. *et al.* "Fetal Cerebellar Biometry and Growth Patterns in Normal and Growth-restricted Fetuses: A Longitudinal Study." *Journal of Clinical Medicine*, vol. 11, no. 9, 2022.
[8] Bekele, D. *et al.* "Utilization of Third-trimester Fetal Transcerebellar Diameter Measurement for Gestational Age Estimation: A Comparative Study Using Bland-Altman Analysis." *AJOG Global Reports*, vol. 4, no. 1, 2024.
[9] Arzik, I.G. *et al.* "Role of Transcerebellar Diameter in Estimating Gestational Age in the Third Trimester: A Comparative Analysis in Fetuses with Different Growth Patterns." *Journal of Ultrasound in Medicine*, vol. 45, no. 4, 2026, pp. 895-903.
[10] Bavini, S. *et al.* "Ultrasonographic Measurement of the Transcerebellar Diameter for Gestational Age Estimation in the Third Trimester." *Journal of Ultrasound*, vol. 25, no. 2, 2021, pp. 281-287.
[11] Patel, M.D. *et al.* "Advances in Fetal Biometry and Gestational Age Estimation." *Radiologic Clinics of North America*, vol. 58, no. 2, 2020, pp. 345-356.
[12] Pistorius, L.R. *et al.* "Fetal Cerebellar Area and Vermis Assessment Using Ultrasound: Clinical Applications and Reference Values." *Journal of Clinical Medicine*, vol. 12, 2023.
[13] Rossi, A.C. and F. Prefumo. "Imaging of Fetal Posterior Fossa: Current Concepts." *Diagnostics*, vol. 11, no. 3, 2021.
[14] Malinger, G. *et al.* "Sonographic Examination of the Fetal Posterior Fossa: Review and Guidelines for Clinical Practice." *Ultrasound in Obstetrics & Gynecology*, vol. 56, no. 3, 2020, pp. 326-337.
[15] Zhen, L. *et al.* "Nomogram of Fetal Transcerebellar Diameter in the Second and Third Trimesters and Its Clinical Significance." *BMC Pregnancy and Childbirth*, vol. 21, 2021.
[16] Gupta, R. *et al.* "Evaluation of Transcerebellar Diameter as a Reliable Parameter for Estimation of Gestational Age in Normal and Growth-restricted Fetuses." *Journal of Obstetrics and Gynaecology of India*, vol. 72, no. 5, 2022, pp. 394-400.
[17] Bansal, M. *et al.* "Ultrasonographic Evaluation of Fetal Cerebellar Measurements and Their Correlation with Gestational Age." *Cureus*, vol. 15, no. 6, 2023.

[18] Reddy, R.H. *et al.* "Significance of Transcerebellar Diameter in Predicting Gestational Age: A Cross-sectional Study." *Journal of Clinical and Diagnostic Research*, vol. 14, no. 2, 2020, pp. TC01-TC04.

[19] Gupta, S. *et al.* "Accuracy of Transcerebellar Diameter in Fetal Age Estimation and Its Correlation with Other Biometric Indices." *Cureus*, vol. 15, no. 5, 2023.

[20] Kummari, S. *et al.* "Determination of the Accuracy of Transcerebellar Diameter in Estimating Gestational Age in the Second and Third Trimesters of Pregnancy." *Cureus*, vol. 16, no. 6, 2024.

[21] Hesse, N. *et al.* "Gestational Age Determination in Neonates Using Transcerebellar Ultrasound Measurements: A Retrospective Study." *Pediatric Radiology*, 2025.

[22] Sharma, G. *et al.* "Evaluation of Transcerebellar Diameter for Gestational Age Assessment in the Second and Third Trimester." *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*, vol. 11, no. 3, 2022, pp. 789-793.

[23] Uzair, M. *et al.* "Cerebellar Diameter as a Fetal Predictor of Gestational Age." *Journal of Diagnostic Medical Sonography*, 2024.

[24] Abonyi, E.O. *et al.* "Gestational Age Estimation Using Fetal Transcerebellar Diameter: A Longitudinal Study." 2025.

[25] Mumtaz, N. *et al.* "Estimation of Fetal Gestational Age Using Transverse Cerebellar Diameter." *Journal of Surgical Medicine and Case Reports*, 2025.

[26] Ali, M.A. *et al.* "Transcerebellar Diameter versus Biparietal Diameter for the Measurement of Gestational Age in Third Trimester." *Journal of Ultrasonography*, vol. 22, no. 88, February 2022, pp. e39-e43. https://doi.org/10.15557/JoU.2022.0007.

[27] Bekele, D. *et al.* "Utilization of Third-trimester Fetal Transcerebellar Diameter Measurement for Gestational Age Estimation: A Comparative Study." *AJOG Global Reports*, vol. 4, no. 1, 2024.

[28] Araujo Júnior, E. *et al.* "Fetal Cerebellar Biometry and Its Clinical Application in Obstetrics." *Journal of Perinatal Medicine*, vol. 49, no. 6, 2021, pp. 679-688.

[29] Paladini, D. and P. Volpe. *Ultrasound of Congenital Fetal Anomalies: Differential Diagnosis and Prognostic Indicators.* 3rd ed., CRC Press, 2020.

[30] Erenel, H. and R. Madazli. "Pons Anteroposterior and Cerebellar Vermis Craniocaudal Diameters in Fetuses with Down Syndrome." *Journal of Ultrasound in Medicine*, vol. 40, no. 1, 2021, pp. 123-128.

[31] Liu, Y. *et al.* "Measurement of Normal Fetal Cerebellar Vermis at 24-32 Weeks of Gestation by Ultrasound and MRI: A Prospective Comparative Study." *European Journal of Radiology*, vol. 105, 2018, pp. 47-52.