

# Fetal Transverse Cerebellar Diameter (TCD) Measurement for Gestational Age Prediction in the Second and Third Trimesters of Pregnancy

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## Abstract

### Background:

The purpose of this study was to see how accurate transverse cerebellar diameter (TCD) measurement is at predicting gestational age in normal fetuses. In the 2<sup>nd</sup> & 3<sup>rd</sup> trimesters of pregnancy a range of sonographics fetal biometric characteristics can be utilized to determine gestational age. Other parameters, such as bi-parietal diameter and fetal length, are used to determine transcerebellar diameter.

**Objective(s):** To determine the predictability of GA estimated from fetal TCD assessed on ultrasonography in the 2<sup>nd</sup> and 3<sup>rd</sup> trimesters of pregnancy.

### Methodology:

This was a cross-sectional study conducted at the Ch. Mohammad Akram teaching and research hospital on 84 pregnant healthy ladies with fetuses ranging in age from 18 to 45 years old. During the 2<sup>nd</sup> and 3<sup>rd</sup> trimesters of pregnancy a routine ultrasound scan was done. In additions to the standard biometric parameter the transcerebellar diameter was estimated.

**Results:** The TCD of 84 patients as a measure of gestational age in weeks. These were generated from data collected during the study and include mean and standard deviation TCD measurements of 84 participants ranging in gestational age from 14 to 40 weeks. The current research found a significant link between the GA of TCD and the GA of BPD and fetal length. The TCD(mm) mean and standard deviations were  $33.74 \pm 11.762$  respectively. The TCD gestational age mean and standard deviations were  $28.160 \pm 6.7942$  respectively. Bi-

parietal diameter (mm) has a mean and standard deviation of  $68.24 \pm 18.503$ . Bi-parietal diameter had a mean and standard deviation of  $27.996 \pm 6.9099$  gestational age. The standard deviation and mean  $50.32 \pm 16.265$  mm Fetal length The mean and standard deviation of fetal length gestational age are  $27.423 \pm 6.7625$ . Different criteria such as transcerebellar diameter, biparietal diameter, and femur length, are used to establish the gestational age of the fetus in this cross-sectional analysis.

**Conclusion(s):**

The TCD is a set of accurate variables for assessing GA in pregnant women in the 2<sup>nd</sup> and 3<sup>rd</sup> trimesters.

**Key words:** Transcerebellar diameter; Gestational age; Fetal length ; Bi-parietal diameter.

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## INTRODUCTION

TCD is a modern parameter for deciding gestational age. The cerebellum has appeared in posterior cranial fossa surround thick petrous ridges and occipital bone which allows to endure extrinsic pressure deformation. USG can detect the fetal cerebellum as early as 10-11 weeks. [1] The cerebellum is usually dumb-bell-shape, in fetal sonographic view, with two cerebellar hemispheres attach centrally by triangular-shaped vermis. [2] TCD measured in millimeters during the second trimester and is numerical equivalent to gestational age weeks. [3]

The age and growth of the Fetus are essential in pregnancy planning management mainly for low birth weight babies. Pregnancies with low-birth-weight babies that are ultrasound screened and managed have a 60 percent lower mortality rate. Crown-rump length is using to determine fetal age and growth during the fifth to tenth weeks of pregnancy. After that, various measurements are using, involve the Biparietal of skull, femur length and abdominal circumference. The ability to determine the range of fetal growth is improving by taking multiple measurements of these parameters over time. These parameter have limitation clinical utility in determining gestational age in late pregnancy or determining fetal development in pregnancy with unknown due dates. They are explained by the fact that as gestational age progressed, biologic variability increased. The assessment abnormally fetal development serial ultrasound scanning determination in 3<sup>rd</sup> trimester is necessary suitable intervention and fetal surveillance.[4]

So, based on the results of our prospective case control study we discovered such TCD measurements is a very important parameter in assessment and calculation gestational age of fetus and that it is good and accurate than others fetal biometric measurement (HC; FL; AC; BPD) that commonly used in pregnant women with no medically problem and our study also reveal high accuracy. Other biometric parameters are greatly affected in clinical scenarios and obstetric conditions etiology false assessment and improper measurement of GA such as hypertensives pregnant women gestation with IUGR infants diabetics mother with macrosomic infants and infants with congenitally and obviously conclude that TCD is good biometric measurements both simple and complicated condition. Since the cerebellar trend of sonographically developing and natural growth is not disrupted or manipulated by these conditions, complicated pregnancies with medical disorders including hypertension, particularly when combined with macrosomics or IUGR infants and standardised morphologically and structural abnormalitie seen sonographically affect organ other than the cerebellum.[5]

Majority women in this geographical region were first identified in their late second and third trimesters. The majority of them are uneducated or from rural culture, and they are unable to remember their last menstrual cycle in order to perform fetal dating. It's difficult to rule out the possibility of intrauterine growth retardation and tiny for date fetuses in such situations. Just a few studies have shown that the sonographic parameter TCD is a good prediction fertilization age in 3<sup>rd</sup> trimester pregnancy. The measurement of the cerebellum unaffected by the fetus growth reduction alternatively acceleration.[6]

In an aim to find a way assess GA some studies have used TCD parameter and the TCD/AC ratio. [7] TCD predicts gestational age between 22 and 28 weeks to be like 0-2 days, between 29 to 36 week to be like 05 days, and 37 week to be like a 9 days of actual fertilization. The normally gram prediction of fertilization age with a 94% exact rate pregnancy in the 3<sup>rd</sup> trimester. In a 2010 study conducting in Pakistan, Khokhar (2012) comparing TCD value of 850 patient pregnancy in 2<sup>nd</sup> and 3<sup>rd</sup> trimester with those of Chavez Hill and Goldstein found no substantial differences up to 28 weeks of pregnancy, but significant differences in the latter part of the third trimester. In the 2<sup>nd</sup> and 3<sup>rd</sup> trimesters of pregnancy, evaluate the using of TCD as an independent parameter for GA determination. [8,9]

Rationale of study TCD is the accurate parameter for the early detection gestational ages in pregnancy 2<sup>nd</sup> and 3<sup>rd</sup> trimester.

## Material & Methods

### Material and Methodology

#### Study Design:

This was cross-sectional prospective analysis. In this study 84 pregnant ladies in 2<sup>nd</sup> and 3<sup>rd</sup> trimesters was observed.

**Settings:** Ch. Mohammad Akram teaching and research hospital.

**Duration of Study:** The study was done from 20 December 2020 to 20 March 2021.

**Sample Size:** n= 84 pregnant women.

#### Selection of Samples:

#### Inclusion Criteria:

1. Maternal age from 18 to 45 years
2. 14 to 40 weeks of pregnancy
3. Regular menses and also known LMP

#### Exclusion Criteria:

Pregnant patients with medically problems like diabetes or high blood pressure, twin pregnancy and first-trimester pregnancy as well as lady with an unexplained Last Menstrual Period.

**Equipment(s) :** ( Canon Xario 200)

#### Statistical analysis

Graphs, charts, and other graphics is created using Microsoft Word and Excel. . The association of each ultrasonographically calculated parameter such as FL, BPD and TCD with the GA the fetus in normal pregnancy was analysis.

#### Ethical consideration:

I was making sure that my research did not endanger any subjects, like medical ethics. Many of the patients signed the document informed consent form. All details and data gathered were kept private. Throughout the report, participants were stored securely. The topic was told that there are no risks or drawbacks to the study method. They were also advised that they might leave the study at a certain point during the research phase.

Variables include:

Bi-parietal Diameter

Fetal length

Transverse cerebellar diameter

#### Data collection procedure:

The aim of my research was to see how well the fetal transverse cerebellar diameter measurements can predict GA 2<sup>nd</sup> and the 3<sup>rd</sup> trimesters of pregnancy. Sample size was selected 84 which will be the fulfilling the eligibility criteria and I was definitely informed about the nature of study of selected population. They were allowed to properly read the consent form which was issued from the head of my department. The subjects were allowed either to fill the questionnaire or to withdraw at any point of fulfilling the questionnaire whereas, I will also be there to provide the guidelines if they need it. All information gathered during the analysis was kept private and stored on a server with a password. All data in paper format is held in locked cabinet.

## RESULTS

The TCD of 84 patients as a measure of gestational age in weeks. These were generated from data collected during the study and include mean and standard deviation TCD measurements of 84 participants ranging in gestational age from 14 to 40 weeks. The current research found a significant link between the GA of TCD and the GA of BPD and fetal length. According to Table 1, The TCD(mm) mean and standard deviations were  $33.74 \pm 11.762$  respectively. The TCD gestational age mean and standard deviations were  $28.160 \pm 6.7942$  respectively. Bi-parietal diameter (mm) has a mean and standard deviation of  $68.24 \pm 18.503$ . Bi-parietal

diameter had a mean and standard deviation of  $27.996 \pm 6.9099$  gestational age. The standard deviation and mean  $50.32 \pm 16.265$  mm Fetal length The mean and standard deviation of fetal length gestational age are  $27.423 \pm 6.7625$ . Different criteria, such as transcerebellar diameter, biparietal diameter, and femur length, are used to establish the gestational age of the fetus in this cross-sectional analysis. Transcerebellar diameter gestational age is compared to other variables. Table 2 Between GA of FL, GA of TCD, and GA of BPD, regression analysis was used to estimate gestational age. TCD is a dependent variable (mm). GA of FL, GA of TCD, GA of BPD are all predictors. Table 3 shows the link between TCD and each of the other factors using regression analysis. TCD has the best connection with the gestational age of all the variables assessed. Table 4 For the total study correlations were found between fetal TCD and GA (correlation coefficient). TCD is a dependent variable (mm). The scatter plot shows (Fig.1) a positives direct connection between the TCD gestational age and the TCD (mm). Fetal length (mm), biparietal diameter (mm), gestational age of Fetal length, and GA of bi-parietal diameter all have a positive relationship with a GA of the TCD.

Table 1

**Statistics**

		TCD(mm)	GA of TCD	BPD(mm)	GA of BPD	FL(mm)	GA of FL
N	Valid	84	84	84	84	84	84
	Missing	0	0	0	0	0	0
Mean		33.74	28.160	68.24	27.996	50.32	27.423
Std. Deviation		11.762	6.7942	18.503	6.9099	16.265	6.7625

**Table 2** Regression analysis for estimating gestational age between GA of FL, GA of TCD, GA of BPD

**Variables 2<sup>nd</sup> and 3<sup>rd</sup> trimester<sup>a</sup>**

Model	Variable Entered	Variables Removed	Method
1	GA of FL, GA of TCD, GA of BPD <sup>b</sup>	.	Enter

- a. Dependent Variables: TCD(mm)
- b. All relevant variable given.

**Model Summary**

Model	R	R Square	Adjusted Square	R	Std. Error of the Estimates
1	.986 <sup>a</sup>	.972	.971		2.007

- a. Predictor: (Constants), GA of FL, GA of TCD, GA of BPD

Table 3 Regression analysis was used to find out the correlation between TCD and each of the other parameters.

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11159.846	3	3719.949	923.087	.000 <sup>b</sup>
	Residual	322.392	80	4.030		
	Total	11482.238	83			

- a. Dependent Variables: TCD(mm)
- b. Predictors: (Constants), GA of FL, GA of TCD, GA of BPD

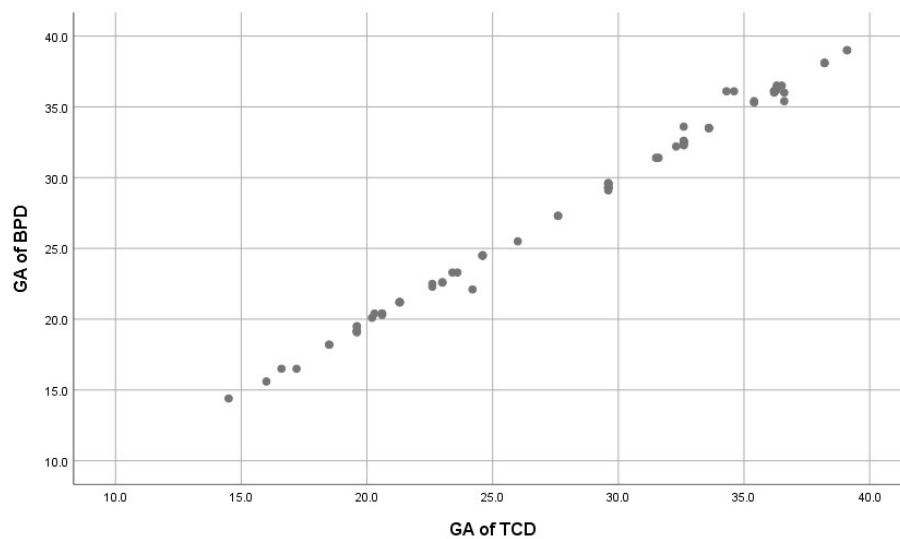
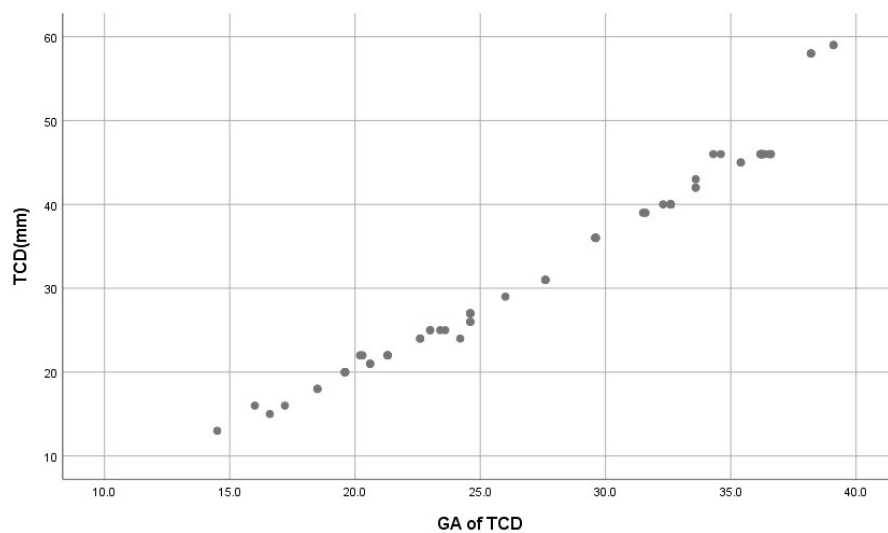
Table 4 For the entire group there was a link between fetal TCD and GA (correlation coefficients)

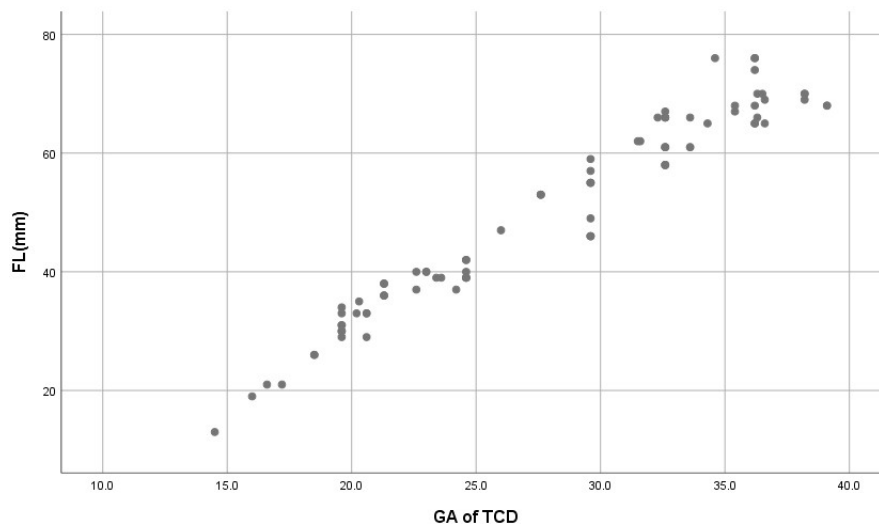
**Coefficient<sup>a</sup>**

Model		Unstandardized Coefficient		Standardized Coefficient	t	Sig.
		B	Std. Error	Beta		
1	(Constants)	-13.433	.999		-13.452	.000
	GA of TCD	.747	.545	.431	1.370	.175
	GA of BPD	1.295	.563	.761	2.301	.024
	GA of FL	-.369	.151	-.212	-2.445	.017

a. Dependent Variable: TCD(mm)

Scatter plot shows positive direct relation between GA of TCD. The TCD(mm) and other given variables.





## DISCUSSION

We found in our study the TCD accurate parameters for assessment GA 2<sup>nd</sup> & 3<sup>rd</sup> trimesters of pregnancy have strong associations the Bi-parietal diameter, Fetal length. The TCD of 84 patients as a measure of gestational age in weeks. TCD measurements of 84 participants ranging in gestational age from 14 to 40 weeks. . Maternal age from 18 to 45 years TCD is a dependent variable (mm). GA of FL, GA of TCD, GA of BPD are all predictors. . TCD has the best connection with the gestational age of all the variables assessed. Our TCD measurement has a similar relations with GA as previously publish nomogram in 2<sup>nd</sup> and 3<sup>rd</sup> trimester of pregnancy. Iram. S et al., the study that had been conducted for modern obstetrics could be built on the basis of predicting gestational age using prenatal sonographic parameters. The TCD serves as an exact estimate of fertilization Age in fetus the obey as benchmark across which other maternal parameter can be calculated. To see if GA, as described by prenatal TCD measured by ultrasound in the 2<sup>nd</sup> to the 3<sup>rd</sup> trimester of pregnancy could be predicted. The cross-sectional study along with a sample size of 319 in good health pregnant women including healthy fetuses aged 18 to 40 years was performed for this reason at Gillani Ultrasound on Ferozpur Road in Lahore. A normal ultrasound test was performed in the 2<sup>nd</sup> and 3<sup>rd</sup> trimesters. The study's conclusion was that TCD was a valid parameters for determining GA pregnancy in the 2<sup>nd</sup> and 3<sup>rd</sup> trimesters.

Some of the disparities between our nomogram results and those of established nomograms in the third trimester could be attributable to sample size. Our research sample was too small and As a result it does not accurately represent our entire population. TCD levels of the population Furthermore, racial and ethnic differences. Differences may also play a part in these disparities. In a 2010 study conducting in Pakistan, Khokhar (2012) comparing TCD value of 850 patient pregnancy in 2<sup>nd</sup> and 3<sup>rd</sup> trimester with those of Chavez Hill and Goldstein found no substantial differences up to 28 weeks of pregnancy, but significant differences in the latter part of the third trimester. In the 2<sup>nd</sup> and 3<sup>rd</sup> trimesters of pregnancy, evaluate the using of TCD as an independent parameter for GA determination.

### Conclusion

TCD accurate indicator of GA in pregnancy second and third trimesters. It have a close relationship with GA, TCD, BPD, FL . The TCD is accurate parameters for determining GA in pregnancy 2<sup>nd</sup> and 3<sup>rd</sup> trimesters. Our TCD measurements in pregnancy second trimester have a close association with the gestational age as previously publish nomograms. Where others proven biometric indices are difficult to obtains it is a very useful tool.

### CONFLICT OF INTEREST/DISCLOSURE

There is no conflict of interest in this research.

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