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Value Of Ultrasound in the Evaluation, Estimation & Assess Relation of Transverse Cerebella Diameter with Fetal Gestational Age Parameters in Normal & Reduced Fetal Growth Fetus

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Abstract-*The current research aimed to examine the value of ultrasound in estimation & assess relation between TCD and GA parameters in normal and reduced fetal growth, the study had been done in Mosul city (Iraq) in private ultrasound clinic during the period from 2015-2019 , and applied on 150 pregnant women (with normal and reduced fetal growth fetuses) , where the age of pregnant women ranged from 17-37 years , the research continued for the three trimester of gestational age (5-40 weeks) , cross-sectional approach was applied . Using ultrasound during the research period to measure TCD for pregnant women revealed a correlation between TCD and GA where their relation appeared as linear relationship. The research also proved that the ultrasound technique has a significant value in assess, estimate and evaluate transverse cerebella diameter relation with fetal gestational age and its parameters such as (BPD, FL, HC, AC) . It was also found that there is a positive relation between the transverse cerebral diameter (TCD) and the other parameter of GA such as BPD, FL, HC, and AC*

Keywords: *Ultrasound, Evalution, Relation, Fetal Gestational, Parameters, Growth Fetus*

I INTRODUCTION

Estimate the period of pregnancy is considered as one of the most important issues in the field of gynecology and obstetrics, in a country like Iraq, women often forget to record the last menstrual period (LMP), thus, many techniques have been used to estimate GA. Ultrasound is one of the most common techniques for detecting fetal age.

Ultrasound has been reported as Ultra- precision method to estimate expected date of delivery and gestational age(1).However , prior to ultrasound using which very common now , doctors relied on their calendar and physical examination of the pregnant women to estimate gestational age clinically, but by emerge of ultrasound ,it became easy to measure the fetus , thus determine fetal gestational age (2) Evaluation and estimation of fetal gestational age is critically for obstetric because it is a step towards assessing fetal growth and follows his advances. For the estimation of fetal gestational age, there are commonly used parameters such as

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abdominal circumference/ AC;, biparietal diameter BPD/;, femur length/ FL; head circumference/ HC. Also from these common indicators that used to estimate the fetal gestational age, measuring the transverse cerebella diameter or TCD, hence the growth of fetal cerebellum begins at 5th week of antenatal life, and its growth continuing during gestational period [3] In pregnancy cases through which up-normal fetuses growth occur, the transverse cerebella diameter could be a reliable parameter for gestational age by comparison to normal fetus measurements [4]

The transverse cerebella diameter (TCD) has been proven as an accurate and reliable Nomogram to predict gestational age by approximately 94% percentage of predication in the pregnancy' third trimester [5]

Thus, this research targeted the following:

- examine the value of ultrasound in the evaluation, estimation & asses relation of transverse cerebella diameter with fetal gestational age parameters in normal fetal growth
- examine the value of ultrasound in the evaluation, estimation & asses relation of transverse cerebella diameter with fetal gestational age parameters in reduced fetal growth
- confirmation of the relationship between gestational age and transverse cerebella diameter/ TCD in of gestational age prediction in normal and reduced fetuses,

II PATIENTS ,MATERIAL AND METHODS

The current research has been conducted at , Al-Mosel City Iraq; the sample consisted of 150 pregnant women in trimester of pregnancy. Comprising both normal and reduced fetus pregnancy cases . where the special cases of pregnant women their fetuses had growth problems they suffered from Intrauterine growth(restriction according to growth retardation standards). women who were subjected to the research have age ranged between (22-37) years . Retrospective analysis has been performed in the two groups of women (normal and reduced) ..

The study was conducted During pregnancy (from first trimester –to third trimester) from 5 to 37 weeks, while the cerebellum usually begin to appear at 5th week of the pregnancy [6]. All over the research period, the transverse cerebella diameter was measured , in both normal cases and up-normal ones, as well as ,all pregnant women underwent to regular antenatal care and ultrasound examination.

Patients women Who suffer from diseases such as diabetes, high blood pressure, sickle cell hemo-globinopathy , severe anemia and any other congenital disease have been excluded .

Regarding measurements, they have been conducted using ultrasonic devices from Sono Ace R3 type which is a real time ultrasound apparatus with linear and sector array 3.5 MH2 frequency transducers

III MEASUREMENTS OF TCD TECHNIQUE

To obtain TCD measurement , an electronic calipers was used , through place it on the cerebellum' outer surrounding , as the , cava, septum pellucidum and third ventricle thalamic parameters have been determined therefore , the transducer was rotated below the thalamic surface .The posterior fossa is appeared in the shape looks like butterfly .The cerebellum could be seen as two lobules on both side of midline in posterior fossa [7]:

These mentioned shapes could be seen in the following image which taken for fetus by ultrasound

Figure 1: Captured ultrasonic image for measurement of TCD(for a fetus at 20 weeks)

After that, an assessment to evaluate the ratio between TCD /transverse cerebella diameter & gestational age (GA) was performed. As well as , the Biparietal diameter/BPD, femur length/FL, head circumference / HC and abdominal circumference (AC) have been measured for all pregnant women as parameters to assess fetal gestational age and determine the relation between fetal gestational age and these parameters , also to know the correlation between TCD and the same parameters. Then regression analysis and correlation coefficient in normal & reduced fetal growth fetus have been estimated to show its relation to gestational age, then , all data have been assembled and statistic analysis for them have been conducted .

The examined cases have been selected for many reasons:

(1) The cases that had previous up-normal fetuses.

(2) Affected parent or any recorded up-normal cases in family.

(3) Women with fetuses that suspected to have abnormalities measurements.

Regarding the normal pregnancy cases, they have been chosen according

The following conditions: (1) reliable last menstrual period dates;

2) Menstrual dates that were confirmed via ultrasound measurements of crown–rump length (CRL) or Biparietal diameter

3) Lack of any evidence for anomalies fetal measurements through examination

(4) Cases that don't underwent any therapy or taken medicine except vitamins tablets;

IV OBSERVATION AND RESULTS

Research had been done in Mosul city (Iraq) in private ultrasound clinic during the period from 2015-2019.

Within the measurements of some normal cases, it has been concluded the average of TCD was assessed by 16.75 mm at weeks ranged from 14-20, and it was 25.92 mm at 21-30 weeks, it estimated by 40.80mm till 40 week (showed in table 1).

Table 1: the averages of TCD in some normal cases (for trimesters of pregnancy)

Grade of GA	Gestational periods In weeks	NO of pregnant women	averages of TCD
G1	14-20	21	16.75
G2	21-30	28	25.92
G3	31-40	15	40.80

This research indicates that the average of pregnant Women ' age in the cases of normal pregnancy was 28.1 ±3.17 years ,and In the cases women with reduced fetuses was 23.1 ±3.36 years with no statistically significant differences (P 0.24) (table2).

Table 2: the ages of normal and up-normal cases

Averages of the ages ±SD	Normal cases	Induced fetuses	P value
	was 28.1 ±3.17	23.1 ±3.36	0.24

By observing the average of TCD that has been investigated regarding its relation to gestational period by weeks, a linear relationship has been recorded between them (i.e. TCD average /GA). This linear relationship represented in the form of scatter diagram (figure1).

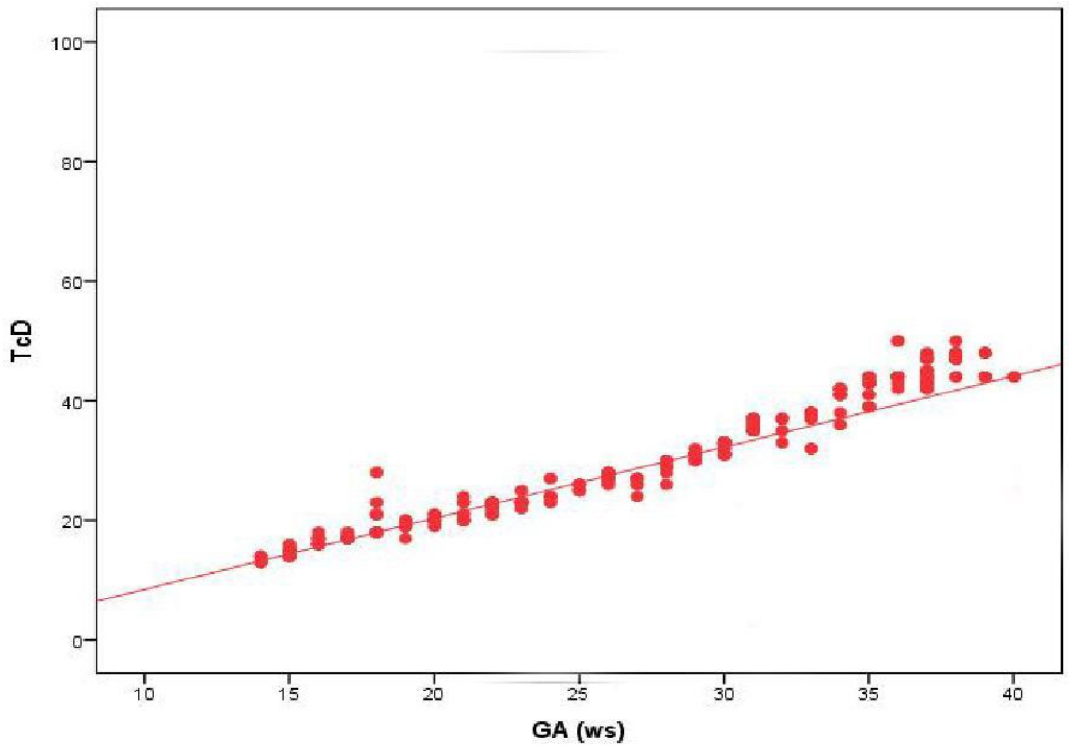

Figure 2: shows the correlation of TCD and GA as it direct relation (TCD average /GA)

Also, It was found Correlation coefficient estimated by 0.79 between transverse cerebella diameter and gestational age with statistically significant equal (P < 0.00). This result points to a high degree of correlation between transverse cerebella diameter and gestational age (table3).

Table 3: dependent variable' Coefficients / transverse cerebella diameter mm

	Coefficients (Un-standardized)		Coefficients (standardized)	T test	
Constant	B	SE	Beta	T value	Significant
gestational age	12.132	0.76		17.1	0.000
	0.530	0.26	0.801	22.40	0.000

.It was also indicated that, the value of regression analysis of GA with TCD is 0.87; this referred to 87% Of TCD can be assessed and estimated

By estimation of GA, this is also means predication of GA through ultrasound for TCD has very big significant value, where P< 0.000

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This also emphasis on the highly significant relationship between TCD and GA which determined by using ultrasound (table 4)

Where TCD= 0.530 X GA +12

Percentage of clinically suspected cases of reduced fetal growth, at different gestational age, from total cases, categories ranged from 0% (16-20 weeks) to 490% (>36-40 weeks). Maximum suspected cases with for reduced fetal growth had been recorded in gestational age >36-40 weeks (49%) followed by >24-28 weeks (27%), >32-36 weeks (16%), >28-32 weeks (13%) and >20-24 weeks (6.1%). It was also noted that none of the cases had been clinically suspected for reduced fetal growth between 16-20 weeks. There was a significant difference in percentages of clinically suspected reduced fetal growth cases at different gestational age groups

Table 4: Correlation between GA and each of (BPD, FL, HC, AC and TCD) in normal cases of pregnancy assessed by ultrasound

Correlation	Gestational age in weeks	
	R2	P value
GA with BPD	0.88**	0.000
GA with FL	0.83**	0.000
GA with HC	0.85**	0.000
GA with AC	0.84**	0.000
GA with TCD	0.87**	0.000

In reduced fetal growth pregnancy, the value of regression analysis between GA and TCD was (0.86), and it was statistically significant. Which points to that 86% of TCD can be estimated and assessed by gestational age and vice versa , and it could be used in predicting the gestational age because of their high significantly relation (table5).

Table 5: Correlation between GA and each of (BPD, FL, HC, AC and TCD) in reduced fetal growth cases of pregnancy assessed by ultrasound

Correlation	Gestational age in weeks	
	R2	P value
GA with BPD	0.45	0.460
GA with FL	0.43	0435
GA with HC	0.41	0.019
GA with AC	0.19	0.471
GA with TCD	0.86	0.003

The research also concluded to that the transverse cerebral diameter had a positive relation with the other parameter of GA such as BPD, FL, HC, and AC especially in the second, third, with *R* values of .960, .940, .938, and .947, respectively (Table 6) ($P < .001$).

Table 6: the relationship between TCD and GA parameters (FL, BPD, HC, and AC)

	TCD AND BPD IN (mm)	TCD AND FL (mm)	TCD with HC (mm)	TCD with AC (mm)
R	0.960	0.940	0.938	0.947
P	0.000	0.000	0.000	0.000
N	695	695	695	695

V DISCUSSION

Determination of gestational age is essential in Gynecology and Obstetrics in order to manage pregnancy and evaluate, assess and estimate fetal development. It was reported higher mortality in patients whose date of delivery couldn't be expected [8] Within estimation of gestational age (GA) any error can occurred in pre-mature and post-maturity , unsound fetal growth contributes in perinatal newborn baby morbidity and mortality[9].

The ultrasonic detection in this research has been reported as a valid and useful method in measuring transverse cerebral diameter in order to assess and estimate the gestational age of fetus in both cases normal and reduced of fetal growth, it also considered as a promise than any other methods regarding prediction of reduced fetal growth, this agrees with many studies. [10-11]

Many researchers have concluded to the use of TCD and the TCD/AC percentage targeting to reach a method to assess the gestational age and determine the Small for gestational age fetus [12]. In the current research the fetal TCD was investigated for normal and reduced fetal growth.

The measurement of TCD in normal fetal indicated to increases in size by the double during the second trimester of pregnancy period. several studies concluded that TCD could be benefit to estimate fetal age, especially in cases where extrinsic pressure may deform the skull and reduce BD of fetus [13]

Accurate GD is critical and essential in management of pregnancy cases especially among women with fetuses who have growth disturbances such as induced fetal growth techniques used in estimate the pregnancy date should be easy and straightforward, regardless of GA [14]

Also , in the current research , the TCD had be proven as an better parameter in evaluation the fetal growth and GA than any other parameter., this result agrees with other studies [15]

In the current research, the image of cerebellum in fetus which taken by ultrasound could be seen as two lobules on both sides of the midline, present in posterior cerebral fossa. Also, by assessment and estimation through ultrasound, the relation between TDC and GA was direct given linear relation, could be represented in scattered line, this is agrees with many studies **[16-17]**

As the transverse cerebral diameter had a positive relation with the other parameter of GA such as BPD, FL, HC, and AC.

VI CONCLUSION

Graduated monitoring for gestational age development and management of obstetric could be performed recently by ultrasound advanced devices ultrasound biometry parameters are effective in estimation of gestational age, especially with the difficulty to calculate the correct LMP. Several researches including the current one have been proved the important of ultrasonographic techniques in assess and measure transverse cerebral diameter (TCD), which in turns leads to assess and estimate gestational age (GA). The ratio between TCD/GA is taken a linear relationship, which means the development of TCD during the pregnancy period from 5-40 weeks regularly . it was also found that there is a positive relation between the transverse cerebral diameter(TCD) and the other parameter of GA such as BPD, FL, HC, and AC. The research also concluded to the efficiency of ultrasound in assesses and estimate fetal growth and gestational age in both normal and reduced fetus.

REFERENCES

1. Zeenat Kausar el al .(2019) .Accuracy of Ultrasound of determine gestational age by measurement of biparietal diameter in Kashmir I population . International Journal of Scientific Research · March 2019
2. Kimberly Butt el al .(2014) Determination of Gestational Age by Ultrasound, J Obstet Gynaecol Can 2014;36(2):171–181 , No. 303, February 2014
3. R Nagesh1 el al .(2016). Transverse Cerebellar Diameter – An Ultrasonographic Parameter For Estimation of Fetal Gestational Age International Journal of Contemporary Medical Research Volume 3 | Issue 4 | April 2016
4. S. Iram et al. (2018) Int. J. Appl. Sci. Biotechnol. Vol 6(4): 379-385 DOI: 10.3126/ijasbt.v6i4.22129
5. Meyer WI, Gawthien DW, Golden berg B, Santolya, et al. (1993): Fetal TCD, AC ratio: As gestational age independent method of assessment of assessing fetal size Journal Med; 12:379-82.
6. Fei Liu el al .(2011). Development of the human fetal cerebellum in the second trimester: a post mortem magnetic resonance imaging evaluation J. Anat. (2011) 219, pp582–588 Journal of Anatomy a 2011 Anatomical Society of Great Britain and Ireland
7. Mustafa Z Mahmoud, Omer A Mahmoud, Alsfi A (2013): Fetal transverse cerebellar diameter measurement for prediction of gestational age in pregnant Sudanese ladies. International Journal of Life Science. 3: 89-93.
8. Elkafrawy , Mona elsyad el al .(2015) Correlation Study of Transverse Cerebellar Diameter with Gestational Age in Normal and Growth Restricted Fetuses (IUGR). Journal of American Science 2015;11(12)
9. Chervenak FA, McCullough LB, Chervenak JL (1989): Prenatal informed consent for sonogram: an indication for obstetric ultrasonography. Am J Obstet Gynecol 161: 857-860.
10. Gottlieb AG, Galan HL (2008): Non-traditional sonographic pearls in estimating gestational age. SeminPerinatol., 32: 154-60

11. Mohamed Taha Ismail andMohammed ,Reham Mostafa el al .(2018). Assessment of Accuracy of Three Ultrasound Methods for Prediction of Intrauterine Growth Restriction. The Egyptian Journal of Hospital Medicine (April 2018) Vol. 71 (2), Page 2505-2511.
12. Vinkensteijn AS , Mulder PG , el al (2000) .Fetal transverse cerebellar diameter measurements in normal and reduced fetal growth Obstet Gynecol 2000 no1 p47-51
13. Mcleary RD, Kuhns LR, Barr M. Ultrasonography of the fetal cerebellum. Radiology. 1984;151:439-42.
14. Anirban DG, Arindom B and Rammurtl N (2012): Gestational age estimation using transcerebellar diameter with grading of fetal cerebellar growth. National J of clinical anatomy 1(3): 115-120.
15. Guan B. Surveillance of fetal growth and fetal cerebellar transverse diameter by ultrasonographic measurement. Zhonghua Yi Xue Za Zhi. 1992;72(2):65-7.
16. Prabhat , Goel el al .(2010) .Transverse cerebral diameter . A marker for estimation gestational age , Journal Soc . India 158-161
17. Ravindernath M. L el al .(2017). Accuracy of transverse cerebellar diameter measurement by ultrasonography in the evaluation of foetal age, International Journal of Advances in Medicine Ravindernath ML et al. Int J Adv Med. 2017 Jun;4(3):836-841