

Comparison of Fetal Kidney Length with Biparietal Diameter (Bpd) in Second Trimester and Femur Length (FL) in Third Trimester for Prediction of Gestational Age

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ABSTRACT:

To compare the accuracy in estimation of gestational age with fetal kidney length and biparietal diameter (BPD) in second trimester. To compare the accuracy in estimation of gestational age with fetal kidney length and femur length (FL) in third trimester. Obstetric sonography was performed in 200 pregnant women with uncomplicated pregnancy to evaluate the efficacy of kidney length (KL) as a measure to calculate the predicted gestational age. Gestational age ranges from 20 weeks to 38 weeks. Only patient with known LMP, previous history of normal menstrual cycle and without any exclusion criteria were included in the study. In the field of obstetrics to achieve a good perinatal outcome, gestational age assessment is vital, because both prematurity and post maturity of the foetus have many untoward effects on the foetus.

Keywords: Obstetric sonography, leukemia, foetal kidney and postmaturity.

1.INTRODUCTION

Obstetric sonography is crucial for determining the intrauterine gestational age accurately. Estimation of fetal development is one of the most common issues that an obstetrician encounters. The foregoing are some of the reasons why knowing your gestational age is relevant. 1: I To schedule an elective delivery within the time period of a term pregnancy or to expect a natural spontaneous delivery. In certain cases, such as preeclampsia, IUGR, diabetes, and a sensitized Rh negative mother, an early termination is needed as soon as the fetus reaches maturity. ii) To take into account invasive techniques such as chorionic villus screening, genetic amniocentesis, and biochemical test analysis. iii) To assess the development of the foetus. If the foetus is born with an anomaly, the gestational age has an impact on the management judgment. Prior to the invention of sonography, gestational age was determined by using i) menstrual history and ii) a physical inspection of the uterus. iii) used an X-ray to determine the gestational age of the ossification core. However, there is a lot of variation in these numbers. one and two Failure to correctly estimate GA can lead to unnecessary induction, dysfunctional labour, operative delivery, iatrogenic prematurity or postmaturity, false test interpretations, and fetal therapy delay or failure,

both of which increase perinatal morbidity and mortality. three, four,

The use of ultrasound as a medical modality has advanced tremendously in the last two decades, revolutionizing management and leading to improved treatment. This is due to its non-invasive, non-ionizing nature, and ease of distribution, as well as its cost effectiveness, which leads to a higher level of acceptance. Diagnostic ultrasound's excellent safety record is likely one of the main reasons for its widespread use. 5 The sonologist, the patient, and the foetus are all healthy by using ultrasound. Ionizing radiation, such as that used in radiography, 6 as well as any other documented biological or embryotoxic effect have not been identified. It does not necessitate the use of injections, which are often necessary in imaging tests. 7 As with X-rays, a single or prolonged intrauterine exposure to ultrasound, early or late in pregnancy, has no known chance of developing lymphatic or myeloid childhood leukemia. It hasn't been linked to any negative effects on fetal development, growth, or vision or hearing in children. 9

Similarly, no negative effects on the children's neurological growth or associated academic success have been observed. 10 When conducted during the first and early second trimesters (24 weeks), ultrasound measurements of fetal biometry (CRL, BPD, FL) are known to be accurate. There is currently no single fetal marker that can be used to accurately estimate gestational age in the third trimester, especially in women who booked late and were uncertain about their LMPs. 3

Sonographic estimation of foetal kidney length has been the subject of many longitudinal studies in Western countries. Initially, these tests were used to diagnose renal malformations in utero, and later, they were used to determine the relationship between fetal kidney duration and gestational era. As a result, we decided to use sonography to measure the fetal kidney duration and use it as a new metric for determining gestational age. As a result, the aim of this research is to prove that there is a linear relationship between these two variables.

2.MATERIALS AND METHODS

A prospective study was done in 200 Pregnant mothers without any complications between the 20th week to 38th week of gestation in out patient and in-patient sections of Obstetrics and Gynaecology department of SreeBalaji Medical College and Hospital, Chennai, from February 2015 to August 2016. This study was undertaken to determine comparison of fetal kidney length with biparietal diameter (BPD) in second trimester and femur length (FL) in third trimester for prediction of gestational age .

INCLUSION CRITERIA :

- Reliable LMP
- Dating confirmed by first trimester USG
- Singleton pregnancy
- Age of 20-35 years
- Women of GA 20-38 weeks
- Women of any gravidity

EXCLUSION CRITERIA:

- Multiple pregnancies
- Dilated renal pelvis
- Women who are diagnosed with hypertension, renal diseases, diabetes.
- Oligohydramnios, polyhydramnios
- Fetal anomaly
- Fetal growth restriction

ETHICAL CLEARANCE:

The study required performing obstetric ultrasonography in normal pregnant women. Ethical clearance was obtained from the Ethical Review Committee of SreeBalaji Medical College & Hospital.

METHOD OF STATISTICAL ANALYSIS:

The mathematical kit for social science was used to conduct the research (SPSS). The frequency of the data was expressed as mean (SD) and the standard deviation was used as a metric of variance. Regression analysis was used to investigate the association between fetal kidney duration and other fetal parameters such as BPD and FL. The level of importance was expressed as a 'P' number, with a value of 0.05 considered meaningful.

3.RESULTS

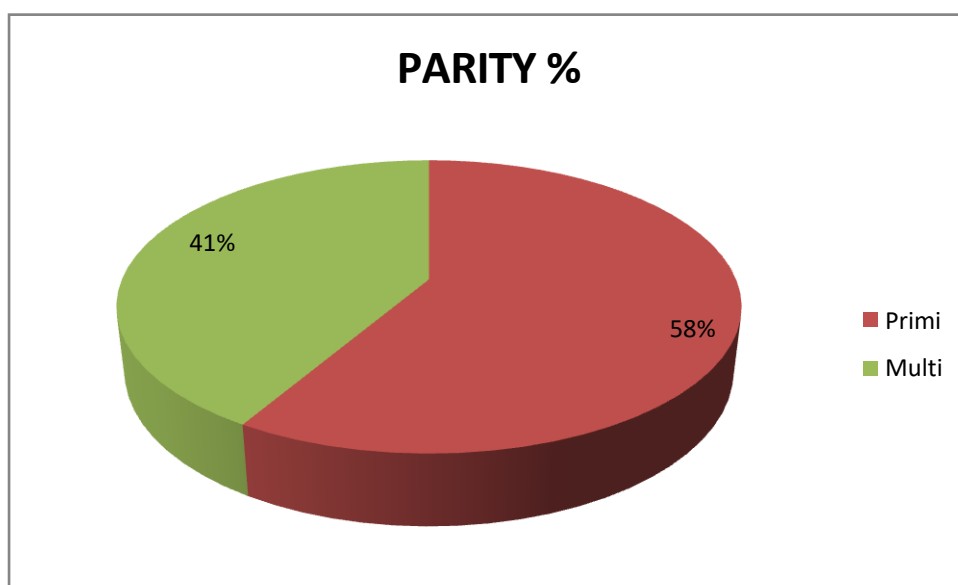
TABLE 1 :AGE DISTRIBUTION

AGE (in years)	No of cases	%
20 – 25	056	28
26 – 30	109	54
31 – 35	035	18
TOTAL	200	100
MEAN	24.81	
SD	3.11	

The age of 200 patients included in the study was in the range of 20 to 35 years with the mean age of 24.81 years. Out of 200 patients included in the study, 56 (28%) were in the age group of 20 - 25 years, 109 (54%) were in the age group of 26 -30 years and 35 (18%) were in the age group of 31-35 years.

Figure 1: PARITY DISTRIBUTION

Out of the total cases, 117 cases (59%) were primi and 83 cases (41%) were multiparous.



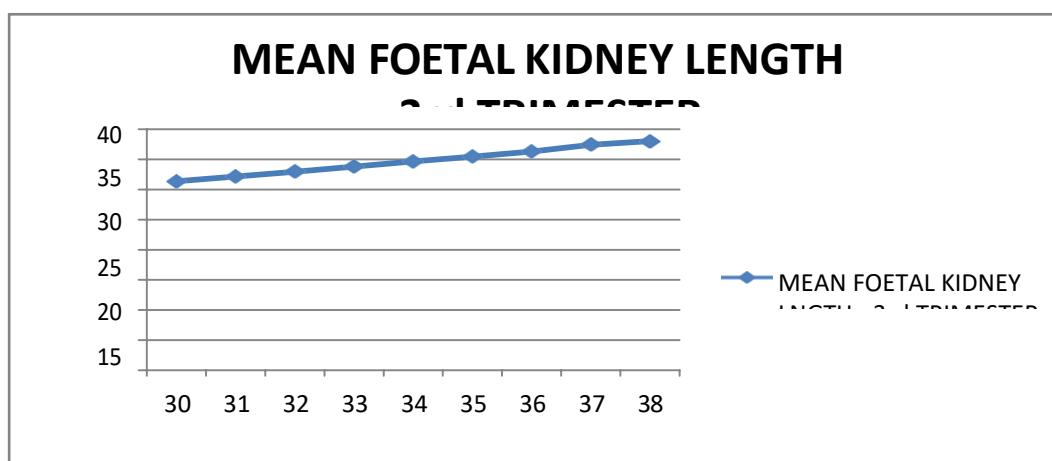
**TABLE 2: TRIMESTER GESTATIONAL AGE
DISTRIBUTION**

GESTATIONAL AGE (WEEKS)	NO OF CASES	%
20	45	23
21	43	22
22	40	20
23	28	14
24	23	11

25	21	10
TOTAL	200	100

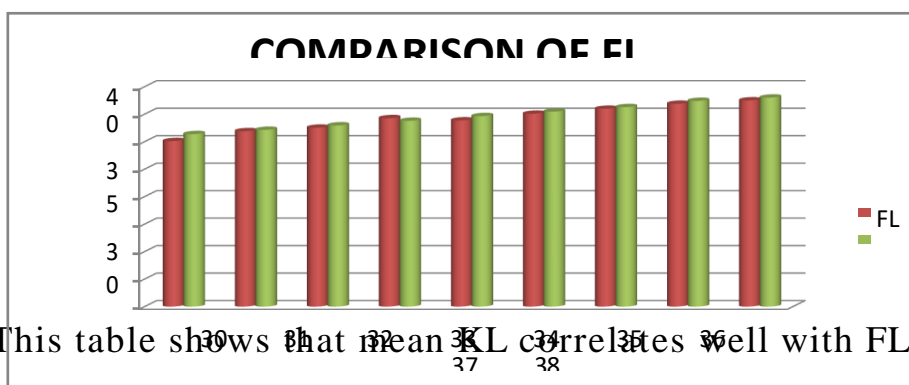
Among the total cases, the majority of the 2nd trimester the cases were from the first few weeks. ie.,20th week (23%), followed by 21 st week (22%) and 22 nd week (20%). All the other cases were distributed marginally in all the weeks belonging to this trimester.

Figure 2: MEAN FOETAL KIDNEY LENGTH- 3rd TRIMESTER



The mean foetal kidney length records a linear growth with respect to the gestational age. During the 2 nd trimester, the mean foetal kidney length recorded as 21.69 mm in the left kidney and 21.71 mm in the right kidney at the 20th week of pregnancy and it showed a consistent growth for almost all the cases. At the end of the 38 th week, the mean foetal kidney length was recorded as 38.02 mm in the left kidney and 38.01 mm in the right kidney.

Figure 3: :Association between gestational age and KL & FL in the study group in 3rd trimester.



This table shows that mean KL correlates well with FL in the

estimation of gestational age.

TABLE 3: Linear regression equation of various indices comparison of 2nd trimester and 3rd trimester - KL/FL/BPD in relation to gestational age.

2nd TRIMESTER:

Parameter	Intercept Estimate	SE	Slope Estimate	SE	P Value	r ²	SE _P
KL	1.203	0.353	0.832	0.105	0.015	99.5	8.17
BPD	1.782	0.330	0.411	0.902	0.000	99.0	9.23

3rd TRIMESTER:

Parameter	Intercept Estimate	SE	Slope Estimate	SE	P Value	r ²	SE _P
KL	2.458	0.233	0.849	0.233	0.000	98.9	8.34
FL	2.710	0.496	0.432	0.496	0.289	97.9	9.58

The above tables show the equations derived from linear regression analysis when the individual variables were considered separately. In the 2nd trimester, KL recorded with standard error of 8.17 days, compared to the BPD which recorded standard error of 9.23 days. There was no significant difference between KL & BPD measurement's importance because the corrected BPD measurement were used.

In the 3rd trimester, the most accurate was KL with standard error of 8.34 days, compared to the FL which had standard error of 9.58 days. Hence, it can be concluded that kidney length is the most appropriate method to estimate the gestational age mainly in the 3rd trimester.

TABLE 4 : COMPARISON OF MATERNAL EIGHT HIGH SHOWED DIFFERENCE.

Maternal Height	Short (n = 8)		Tall (n =7)	
	4	4	5	2
	GA=KL>FL	GA=KL=FL	GA=KL<FL	GA=KL=FL

length and kidney length corresponded to that particular gestational age. On the examination of the above results, it is evident that kidney length is the best predictor of gestational age in 3 rd trimester compared to femur length .

4.DISCUSSION

The role of accurate gestational dating is crucial in the management of pregnancies. Clear and transparent methods for dating pregnancies should be used at all stages of pregnancy. For the best obstetric control of births, accurate and easily reproducible sonographicfoetal biometric parameters for gestational dating are critical. This is particularly valid as it comes to deciding the timing of various gestational checks, evaluating development adequacy, and determining the best delivery time for the best obstetric result. 12

To find out how renal duration correlates with gestational age, researchers looked at 200 women who were not at risk for fetal kidney disease and whose pregnancies ended with a normal fetal outcome. Women in their second and third trimesters, ranging in age from 20 to 38 weeks, were included in the report. The findings were compared to other biometric indices and interpreted in relation to the patient's age, parity, and right and left kidney. 13 Table 1 indicates that 54 percent of the women in this survey were between the ages of 26 and 30, 28 percent were between the ages of 20 and 25, and just 18 percent were over the age of 35. The parity distribution was found to be 59 percent primiparous and 41 percent multiparous (Table : 2). The rest of the cases in the second trimester came from the first three weeks, according to the overall cases. i.e., the 20th week (23 percent), followed by the 21st week (22 percent), and the 22nd week (22 percent) (20 percent). As seen in (Table : 3), all of the other cases were spread slightly over this trimester's weeks, and the rest of the cases in the third trimester were at the end of the trimester. i.e., beginning with the 36th week (15%), then the 37th week (16%), and finally the 38th week (18%).

(17 percent). As seen in the diagram, all of the other instances were spread slightly over the trimester's weeks (Table :4). Both the left and right kidneys are almost identical in size, and the average kidney size corresponds to the same gestational age. For each week of pregnancy, the mean kidney duration and 95% confidence intervals are presented. 14 With respect to gestational age, the mean foetal kidney length shows a linear development. At the 20th week of pregnancy, the mean foetal kidney duration was 21.69 mm in the left kidney and 21.71 mm in the right kidney, indicating steady development in nearly all cases during the second trimester. The average foetal kidney length was 38.02 mm in the left kidney and 38.01 mm in the right kidney at the end of the 38th week, as seen in the graph below (Table : 5 and 6). The results of this analysis indicate that age, parity, and the right or left kidney have little effect on the measurement of renal duration and its relationship to gestational age. It dates pregnancy with a precision of 8.17 days when associated with the second trimester and 8.34 days when correlated with the third trimester, as seen in (Table : 9). 15

Pregnancies may be dated within 8.17 days when correlated to the second trimester and 8.34 days when correlated to the third trimester, according to the report, which is in line with the study by JJ Kansaria et al 2009 46, which was expected by 9.17 days. The linear equations derived from this analysis were contrasted with those derived from Konje et al 200238 for each individual variable. The foetal kidney length, as seen in (Table : 10), was the most reliable, with a standard error (SE) of 10.29 days by Konje et al 38, compared to 8.17 days (based on the second trimester) and 8.34 days (based on the third trimester) by this report. 16

The values of fetal kidney duration at different gestational ages in our sample were lower than those recorded by Cohen et al 1991 47, Konje et al 38, and Lawson et al 1981 50, but comparable to Bertagnoli et al 1983 49 and Jeanty et al 1982. Bertagnoli et al. conducted a research study on 280 pregnant women and discovered that the length of the kidneys changed over time from 22 to 40 weeks of pregnancy. The duration of the fetal kidney rose linearly from 29 mm at 30 weeks to 38 mm at 40 weeks of pregnancy, according to the findings. 17

The current study's findings are also consistent with those of S.Afroz et al 53, as seen in Table 1. (Table : 11) However, since a single USG test for determining gestational age is inefficient after 30 weeks, renal duration dependent on the third trimester may be used as an alternative criterion for determining gestational age and an early means of detecting premature renal growth when used in combination with BPD, FL.

5.CONCLUSION

In the field of obstetrics to achieve a good perinatal outcome, gestational age assessment is vital, because both prematurity and post maturity of the foetus have many untoward effects on the foetus. In conditions like where the mother doesn't remember her last menstrual period or when she had irregular cycles, calculation of EDD is not possible, in such conditions CRL in the 1st trimester is relied upon.

But if the mother turns up in 2nd trimester & 3rd trimester there is no such single reliable marker like CRL for assessing the GA. In this study we have concluded that KL in association with other parameters in 2nd & 3rd trimester has better assessment of GA. In this study we have found that in conditions like constitutionally large or smaller babies where FL is not reliable, KL seems to be a constant parameter for assessing gestational age. Therefore KL should be included in the biometric model of ultrasound assessment of gestational age.

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Ethical approval: The study was approved by the Institutional Ethics Committee

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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