



**ACCURACY OF ULTRASONOGRAPHICALLY DETERMINED FETAL KIDNEY LENGTH IN ESTIMATING GESTATIONAL AGE COMPARED TO OTHER SONOLOGICAL PARAMETERS**

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**ABSTRACT**

In 200 pregnant women obstetric sonography was performed without any complicated pregnancy to assess the efficacy of FKL as a parameter to compute the predicted gestational age. Gestational age ranges from 18 weeks to term. Patients with known LMP and normal menstrual cycle and without any exclusion criteria were included in the study. Fetal biometry was assessed incorporating BPD, HC, AC, FL and FKL. FKL was corresponded with other fetal biometric parameters and clinical gestational age. The correlation was seen to be significant.

**KEYWORDS :**

**INTRODUCTION**

Appropriate assessment of gestational age is quite essential in obstetric care. Accurate knowledge of gestational age may assist obstetricians in appropriately counselling women who are at risk of preterm delivery about likely neonatal outcomes and is also essential in evaluation of foetal growth and the detection of intrauterine growth restriction. Accurate pregnancy dating is also important in the interpretation of biochemical serum screening test or for counselling patients regarding the option of pregnancy termination. Since clinical data such as menstrual cycle or uterine size often are not reliable, the most precise parameter for pregnancy dating should be determined by ultrasound. Ultrasound is an accurate and useful modality for the assessment of gestational age in first and second trimester of pregnancy and, as a routine part of prenatal care, can modify obstetric management and improve antepartum care. If the head unusually rounded or unusually elongated, BPD measurement would overestimate or underestimate the gestational age. Variation in AC measurements in growth retarded foetus occurs due to differences in liver size and the width of subcutaneous tissue has been observed. Femur achondroplasia leads to underestimation of FL and therefore, of gestational age. Therefore new parameter like fetal kidney length (FKL) can become important for measuring gestational age in those circumstances. The current study is done to approve fetal kidney length as an extra morphological estimation of fetal development with less changeability. This estimation is not difficult to take and can hence be effectively consolidated into the model for dating pregnancy following 18 weeks of gestation, especially when estimation of biparietal diameter and head circumference are difficult.

**METHODS AND MATERIALS**

This was a prospective study. Approval from institutional ethics committee was obtained. 200 uncomplicated pregnant women in 18 weeks up to term between the age of 18 to 35 years were taken arbitrarily. Pregnant women excluding those of high-risk group from 18 weeks to term coming for antenatal USG in the department of Radiodiagnosis, Bankura Sammilani Medical College was around 600 per month. So, in our entire period of data collection (11 months) 6600 such pregnant women visited for antenatal USG. Sample size of 100 in second trimester and 100 in third trimester was considered via systematic random sampling. Sampling interval was 6600/200=33rd i.e., every 33rd pregnant woman in the imaginary queue of 6600 was considered starting

selection of the 1st participant unbiasedly by simple random sampling on the 1st day of data collection. Before collecting data on the first day a random number of ≤33 was chosen and the attendee with the corresponding serial number was selected as 1st participant and thereafter every next 33rd patient was selected for the research. If it so happened that the 33rd woman was not willing to participate in the study or did not match the inclusion criteria, then the very next woman was taken. Pregnant women less than 18 wks of GA, oligohydramnios or polyhydramnios, high risk pregnancy, multiple pregnancy were excluded from the study.

Philips USG machine (MODEL NO HD7 2.0.1) and GE HEALTHCARE LOGIQ P9 USG machine was used for this study.

Data was compiled in Microsoft(MS) excel sheet and analysed by appropriate statistical method. Mean and standard deviation was used to describe and summarize continuous variables. Data display was done by the help of tables and various charts.

**RESULT AND STATISTICAL ANALYSIS**

Statistical Analysis was performed with help of Epi Info (TM) 7.2.2.2 EPI INFO is a trademark of the Centers for Disease Control and Prevention (CDC).

Descriptive statistical analysis was performed to calculate the means with corresponding standard deviations (s.d.). Test of proportion was used to find the Standard Normal Deviate (Z) to compare the difference proportions. Pearson correlation coefficient was used to find the correlation between two variables. Regression analysis was performed to find the regression line to predict gestational age based on different parameters. t-test was used to compare two means. Also, One Way Analysis of variance (ANOVA) followed by post hoc Tukey's Test was performed with the help of Critical Difference (CD) at 5% and 1% level of significance to compare the mean values. p<0.05 was taken to be statistically significant.

200 patients were selected randomly. In this study the mean (±SD) age of the patients was 25.99±3.77 years with range 18-35 years and the median age was 26 years.

Pearson correlation between GA and fetal kidney length is 0.984(p less than 0.0001). The regression line to predict gestational age through fetal kidney length was found as

gestational age =  $1.56 + 0.91 \times \text{fetal kidney length}$  [0.91 was the regression co-efficient of fetal kidney length]

## DISCUSSION

This study aimed performing obstetric ultrasonography in uncomplicated pregnant women between 18 weeks to term referred by the Department of Obstetrics & Gynecology B.S.M.C & H, Bankura between the age group 18-35 years with a correctly matched gestational age obtained from LMP and established sonological parameters (BPD, FL, HC, and AC).

200 patients were selected randomly from the patients who attended Gynecology and Obstetrics OPD during the period of study. In this study the mean ( $\pm$ SD) age of the patients was  $25.99 \pm 3.77$  years with range 18-35 years and the median age was 26 years.

In case of pregnant women who register late and those who are uncertain of their LMP, it is often difficult to date pregnancies. Clinical dating methods like LMP and uterine size and sonographic indices like Femur Length, Head Circumference, Biparietal diameter and Abdominal circumference had been shown to fail in accurate GA calculation beyond 28 weeks of gestation.<sup>1,2</sup>

Fetal kidney length (FKL) was reported to be a reliable index in late pregnancy GA estimation.<sup>3,4,5</sup> The mean FKL measured in this study was observed to linearly increase with increasing GA.

The mean FKL with GA was compared with previous studies. It was found to coincide with most studies except two studies which reported slightly higher values.

The higher values seen in those two studies could be due to ethnicity. The mean FKL for pregnancy beyond 28 weeks obtained from this study was found well within reported range of 33.8–to 39.5 mm.<sup>6,7</sup> GA was correlated with different fetal biometric indices and the correlation co-efficient compared with that of FKL correlation co-efficient.

In this study, correlation co-efficient showed that GA with FKL were significantly correlated in late pregnancy. Similar findings were shown in literature reports.<sup>8,9</sup>

During the first 10 weeks of pregnancy, LMPs and sonographic indices were claimed to predict GA to within 4.7 days and between 12 and 24 weeks, to within 6 to 10 days.<sup>10,11</sup> The unreliability of the fetal biometric indices like BPD, HC, AC, and FL in calculating GA in late pregnancy have left place for using FKL as a reliable index. In third trimester using traditional fetal biometric indices, studies have reported GA with error of 6 to 9.45 days.

Meanwhile with FKL added as an additional index, it was shown to increase accuracy with standard error of 5.54 days only.<sup>12</sup>

Even though this study validated and showed linear increase of FKL with progression of gestation, limited sample size and convenient sampling technique used might prove to be a limiting factor

## CONCLUSION

The fetal kidney is not difficult to recognize and quantify the size and it may be used as an investigational parameter in assurance of gestational age determination in second and third trimester of pregnancy. The fetal kidney length is not impacted by the error of the late trimester or by the limitation of development. It very well may be ends up being a significant tool in situations where other set of biometric boundaries are hard to acquire or show gross discrepancies with one another or with gestational age. The current review has shown that

there is a significant correlation between the fetal kidney length and the gestational age and subsequently fetal kidney length can be utilized as an extra boundary for assessment of gestational age. Nomogram of the FKL shows that there is a linear correlation between the FKL and gestational age. FKL positively associated with BPD, HC, AC and FL. FKL can be utilized as a reliable parameter for gestational age determination. FKL is better parameter for gestational age compared BPD, HC, AC as seen by the R2 value of the individual regression models conducted in this study. Moreover, FKL is not affected by unfavourable conditions like in engaged fetal head, dolichocephaly, moulding etc which affect BPD, HC. FL measurements can be faulty due to inclusion of unossified epiphyses. In case of microsomia, malformation or IUGR, AC measurement can give false values. In above clinical scenario FKL measurements give more accurate and reproductive fetal gestational age estimation

## REFERENCES

- 1) Hellman LM, Kobayashi M, Fillisti L, Lavenhar M, Cromb E. Growth and development of the human fetus prior to the twentieth week of gestation. *Am J Obstet Gynecol* 1969;103(6):789–800.
- 2) Garg A, Goyal N, Gorea RK, Pathak N, Mohan P. Normogram from fetal kidney length by ultrasonographically. *J Punjab Acad Forensic Med Toxicol* 2015; 15:14–16.
- 3) Butt K, Lim K; Diagnostic Imaging Committee. Determination of gestational age by ultrasound. *J Obstet Gynaecol Can* 2014;36(2):171–181.
- 4) Gonzales J, Gonzales M, Mary JY. Size and weight study of human kidney growth velocity during the last three months of pregnancy. *Eur Urol* 1980;6(1):37–44.
- 5) Ansari SM, Saha M, Paul AK, Mia SR, Sohel A, Karim R. Ultrasonographic study of 793 fetuses: measurement of normal foetal kidney lengths in Bangladesh. *Australas Radiol* 1997;41(1):3–5.
- 6) Nimala Shivalingaiah Sowmya K, Ananya R, Kanmani TR, Marimuthu P. Fetal kidney length as a parameter for determination of gestational age in pregnancy. *Int J Reprod Contracept Obstet Gynecol* 2014;3(2):424–427.
- 7) Lawson T, Filey W, Berland L, Clark K. Ultrasonic evaluation of lens kidneys. *Radiology* 1981; 138:153–156.
- 8) Edevbie JP, Akhigbe AO. Ultrasound measurement of fetal kidney length in normal pregnancy and correlation with gestational age. *Niger J Clin Pract* 2018;21(8):960–966.
- 9) Robinson HP, Fleming JE. A critical evaluation of sonar "crown-rump length" measurements. *Br J Obstet Gynaecol* 1975;82(9):702–710.
- 10) Campbell S. The prediction of fetal maturity by ultrasonic measurement of the biparietal diameter. *J Obstet Gynaecol Br Commonw* 1969;76(7):603–609.
- 11) Egley CC, Seeds JW, Cefalo RC. Femur length versus biparietal diameter for estimating gestational age in the third trimester. *Am J Perinatol* 1986;3(2):77–79.
- 12) Gupta DP, Gupta HP, Zaidi Z, Saxena DK, Gupta RP. Accuracy in estimation of gestational age in third trimester by fetal kidney length in Indian women. *Ind J Clin Practice* 2013;24(5):459–463.