



## ACCURACY OF ESTIMATION OF GESTATIONAL AGE IN THIRD TRIMESTER BY MEAN FETAL KIDNEY LENGTH

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### ABSTRACT

**Objective:** To evaluate the accuracy of mean fetal kidney length measurement in determining the gestational age in third trimester

**Design:** Prospective study

**Methodology:** normal pregnant women in their third trimester with no maternal or fetal complications were selected and mean fetal kidney length and other biometric parameters were measured and gestational age was calculated for each and compared with LMP derived gestational age.

**Result:** Mean fetal kidney length was close to LMP derived gestational age when compared to other parameters with a significant p value (<0.0001).

**Conclusion:** mean fetal kidney length can be used as single parameter in 3<sup>rd</sup> trimester for estimation of gestational age.

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## INTRODUCTION

The accurate knowledge for estimation of gestational age is very essential for the obstetrician to date a pregnancy and for antenatal care and management of high risk pregnancies, failure of which can result in prematurity or post maturity which is associated with increased perinatal morbidity & mortality. Initially gestational age was calculated based on patients LMP, but this method is not very reliable because most of the women do not recall their last menstrual date or have irregular periods. Since then ultrasound has become a more reliable tool for estimating gestational age. Various ultrasonographic parameters are used to calculate the gestational age like in 1st trimester measurements of CRL, gestational sac diameter are taken. In 2<sup>nd</sup> trimester biparietal diameter, head circumference, abdominal circumference, femur length are measured, but these parameter estimates age from size hence these are not very reliable in 3<sup>rd</sup> trimester. Other recently used parameters are transcerebellar diameter, fetal kidney length and scapular measurements.

Fetal kidney is easy to identify and measure in third trimester and there is a correlation between fetal kidney

length and gestational age, hence this study was undertaken to measure fetal kidney length for estimating gestational age and to compare it with other biometric indices like BPD, HC, AC & FL estimated gestational age.

## MATERIALS AND METHOD

This study is done in the department of obstetrics and gynaecology in RMMCH. A total of 150 antenatal patients in their 3<sup>rd</sup> trimester with early dating scan were included. This study included only uncomplicated antenatal women with single live foetus with no congenital or renal anomalies. Women with preeclampsia, eclampsia, diabetes mellitus and intrauterine growth restriction were excluded from the study.

Routine clinical examination was done and these patients were subjected to ultrasound. Biometric parameters like BPD, HC, AC, FL & mean fetal kidney length were measured and gestational age was estimated for each parameter. This was compared with LMP derived gestational and statically evaluated.

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## RESULTS

In our study a total of 150 patients were included. The mean age of pregnant patients was  $25.04 \pm 3.78$ . Patients were divided in 3 groups. 16% of them were between 28-32 weeks group, 36% of them were between 33-37 weeks and 48% of them were between 38-41 weeks group. Mean kidney length in weeks ( $36.02 \pm 3.03$ ) was found to be more close to LMP derived gestational age in weeks ( $36.53 \pm 3.27$ ), followed by HC which was close to LMP derived gestational age in 3<sup>rd</sup> trimester.

**Table 1** comparison of linear coefficient of different parameters

	BPDGA	HCGA	ACGA	FLGA	MKLGA
LMPGA - R	0.626**	0.611**	0.642**	0.584**	0.714**
P value	0.000	0.000	0.000	0.000	0.000
N	150	150	150	150	150

MKL has a significant p value  $< 0.0001$

**Table 2** comparison of mean age in weeks

	N	Mean	Std. Deviation	Minimum	Maximum
LMPGA	150	36.5333	3.27215	28	41
BPDGA	150	35.3467	2.92177	27	40
HCGA	150	35.4733	3.04044	27	41
ACGA	150	35.2133	3.16988	27	41
FLGA	150	35.3667	3.03982	28	40
MKLGA	150	36.0667	3.38506	27	41

**Table 3** correlation coefficient of various studies

Konje <i>et al</i>	0.93
Nahid Yusuf <i>et al</i>	0.990
Cohen <i>et al</i>	0.82
Jae sung <i>et al</i>	0.983
Present study	0.714

There was a significant correlation between gestational age in weeks and mean fetal kidney length in mm ( $r=0.714$ ) p value was significant ( $p < 0.0001$ ).

## DISCUSSION

The accurate estimation of gestational age is important for the obstetrician because it can affect the clinical management in number of ways. So the methods commonly used involve measurement of BPD HC AC FL. These fetal parameters estimates age from size of the foetus and are therefore less accurate as pregnancy progresses and hence these are not so accurate in third trimester, hence this study is conducted to find how accurate MKL is for estimation of gestational age in third trimester. A good rule of thumb is that menstrual age in weeks approximates the normal fetal kidney length in millimetre & twice the anteroposterior diameter in millimetre.

Mean age of pregnant women in my study was found to be  $25.04 \pm 3.78$  years & all these patients belonged to low socioeconomic status. In our study 62% of the patients were primigravida and 38% of them were multigravida. The mean parity of pregnant women in Konje *et al* was 0.8 (range 0-3). Maternal anthropometrics clearly affects the size at birth. In a study done by Nahid Yusuf *et al* no relationship between fetal renal length derived gestational

age and maternal BMI & socioeconomic status was found. Similarly in our study 45 % of patients had a BMI between 19-25, no association between maternal BMI and GA estimated from MKL was found. In our study all the patients belonged to low socioeconomic status and no association was found with GA. In our study MKL derived gestational age was found to be more close to LMP derived GA in weeks in 3<sup>rd</sup> trimester. Period of gestation has an excellent correlation with gestational age derived from mean kidney length in 3<sup>rd</sup> trimester. Comparison of linear coefficient (r) showed a very strong correlation with gestational age derived from MKL compared to other parameters. The least degree of correlation was seen with FL. MKL is statically highly significant with a p value of  $< 0.0001$  and is very significant between 33-41 weeks of gestation.

In a study done by Nahid Yusuf *et al*, 102 well dated normal pregnant women after 30 week were taken and the relationship between GA estimated from Fetal renal length and GA confirmed from early pregnancy ultrasound was done & they found out that a strong correlation was seen between GA determined by BPD HC AC FL & MKL ( $P < 0.001$ ) & the relationship between MKL and GA was found to be highly significant ( $p=0.00$ ).

Measurement of MKL has been shown to correlate with GA as seen in studies done by Seoy *et al* and Cohen *et al*. though all fetal biometric parameters are affected by the fetal growth; kidney length remains largely unchanged especially in SGA babies. Grannum *et al* analysed 89 patients to determine the fetal renal length and how it varies with GA. They found out that kidney length increase linearly with pregnancy. In our study similarly it has been observed that MKL increases linearly with GA. Chitty *et al* published charts of fetal kidney size and renal pelvis measurements and demonstrated that MKL measurement is more accurate predictor of GA in 3<sup>rd</sup> trimester. Jae sung *et al* also developed a normogram for fetal renal growth expressed in length and parenchymal are by ultrasound. It was suggested that this could be used as a valuable tool for evaluation of fetal growth. The 1<sup>st</sup> report of size of normal fetal kidney length sonographically was by Seoy *et al*. This study used the normogram of Cohen *et al* the degree of correlation between GA & renal length was compared in various studies. The present study was in close agreement.

Kidney length is the most accurate single parameter for estimating gestational age. Measurements of fetal kidney length showed good correlation with gestational age with correlation coefficient  $r=0.696$  and  $p < 0.0001$ . Fetal kidney length measurement can be introduced as a new parameter for estimating gestational age in 3<sup>rd</sup> trimester where as other parameters like BPD, HC, AC & FL are less reliable in 3<sup>rd</sup> trimester.

## CONCLUSION

The study conducted in RMMCH showed that ultrasonographic measurement of mean kidney length is a reliable indicator of gestational age in third trimester. All

parameters have positive correlation with gestational age but compared to other parameters, kidney length has high degree of correlation with a linear coefficient value of 0.714 & p value of <0.0001, which is the best of all parameters in the overall third trimester. The fetal kidneys are easy to identify and measure. Kidney length in millimetre approximates gestational age in weeks. Kidney length is a reliable single parameter used in estimating gestational age in a patient with unknown dates or who presents late for maternal care. In case of doubt where there is a discrepancy between dates and uterine size it is better to include mean fetal kidney length as a part of fetal biometry.

## References

1. J C Konje, K R Abrams, S C Bell & D J Taylor – Determination of gestational age after 24<sup>th</sup> week of gestation from fetal kidney length measurements; ultrasound obstetgynecol 2002; 19: 592-597.
2. Hadlock FP: sonographic estimation of fetal age & weight. Radiol Clin North Am. 1990; 28(1) :39.
3. Nahid Yusuf, Fauzia Moslem, Jasmine Hague. Fetal kidney length – can be a new parameter for determination of gestational age in third trimester. The journal of teachers association. RMC, rajshahi. TAJ December 2007; 20(2) 147- 150.
4. Grannum P, Brackenm, Hobbins J C. Assesment of fetal kidney size in normal gestation by comparision of ratio of kidney circumference Am J obstetgynaecol 1987: 136; 249-254.
5. Sampson MB Engstrom JL, McFarlin BL, Fundal height measurement. Part 4- Accuracy of clinicians identification of uterine fundus during pregnancy. J Nurse MidWifery. 1993 Nov-Dec;38(6) : 318-23.
6. Konje J C, De Chazal R C, Bell S C, Taylor D J. Evaluation of accuracy and reliability of the use of fetal kidney length measurements in determination of gestational age after 24<sup>th</sup> week of pregnancy.Br J Obstetgynecol 1998; 105 : 17-21.
7. Cohen H L, Copper J, Eisenberg P, Mandel F S *et al* normal length of fetal kidneys; sonographic study of 397 obstetric patients. AJR Am J Roentgenol 1991; 157 ; 545-8.
8. Konje J C ,Okaro C I, BELL SC, taylor d j at al. a crosssectional study of changes in fetal renal size with gestational in appropriate and small for gestational age fetuses. Ultrasound obstetgynecol 1997; 9: 35-7.
9. Lyn S Chitty ,Douglas G Altman. Charts of fetal size: kidney and renal pelvis measurements. Prenatal diagnosis. Nov 2003 :23(11):8917.
10. Jae shung shin, yongsooseo. Normogram for fetal renal growth expressed in length and parenchymal area derived from ultrasound. Urology 2007: 14-18.
11. Seo y s. chi y h, choi s j, kin y a. normal size of fetal kidney: sonographic measurements. Korean j obstetgynecol 2003 :46(3) 537-541
12. Cohen H L, Copper J, Eisenberg P, Mandel F S *et al* normal length of fetal kidneys; sonographic study of 397 obstetric patients. AJR Am J Roentgenol 1991; 157 ; 545-8.
13. Mahessent, Hoffman H L .fetal kidney length and gestational age. American journal of roentology 1999 vol 157; 545-548.
14. Yarkoni s Schmidt W jeanty p, reecee, hobbinsjc, clavicular measurements; a new biometric parameter for fetal evaluation. Ultrasound med 1985:4(9):467-70.
15. Platt LD, medearis AL, De Vore GR, Horenstein JM, carlson DE, brarHS.fetal foot length :relationship to menstrual age and fetalmeasurements in 2<sup>nd</sup> trimester. Obstetgynecol 1988: 71(4): 526-31
16. Bertagnoli MD, lalatta md, rusu md, zorzoli. Qunitative characterization of fetal kidney length. J clin ultrasound 1983; 11:349-56

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