

## Foetal Kidney Length as a Parameter for Determination of Gestational Age in Pregnancy by Ultrasonography

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### ABSTRACT

**Background:** The ability to accurately determine the fetal gestational age, growth and recognize its abnormal patterns, help us to decide if early intervention is necessary in high risk pregnancy or not.

**Objectives:** The aim of this present study to estimate the gestational age in third trimester using mean fetal kidney length.

**Material & Methods:** This cross section hospital based study conducted in the department of Obstetrics and Gynecology, S.P. Medical College, Bikaner during study period of one year from 2015 to 2016. Pregnant women (n=100) with known dates of different parity and ages were included in this study. The women were evaluated as per history, general physical examination and routine antenatal investigations and using third trimester ultrasonography.

**Results:** In present study, gestational age was ranging from 28 to 40 weeks and their mean kidney length was ranging from 28.00 to 40.00 mm. Maximum number of cases was found in gestational age 36 & 37 weeks (n=17 each) while least

common gestational age was 39 & 40 weeks where only 1 patient was found in each.

**Conclusion:** The fetal kidney length increases with each week of gestation. However, large and multicentric studies are required to recommend it.

**Key Words:** Gestational age, Kidney length, Fetal.

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### Article History:

**Received:** 10-10-2016, **Revised:** 23-10-2016, **Accepted:** 06-11-2016

| Access this article online                                   |  |
|--|--|
| Website:<br><a href="http://www.ijmrp.com">www.ijmrp.com</a> | Quick Response code<br> |
| DOI:<br>10.21276/ijmrp.2016.2.6.013                          |  |

### INTRODUCTION

A true estimation of gestational age (GA) plays an important role in quality maternity care such as assessment of fetal growth and to schedule the labor date. Any inaccurate estimation may lead to perinatal morbidity and mortality due to iatrogenic pre or postmaturity. Accurate monitoring of fetal gestational age is one of the most critical components of prenatal care. Ultrasound has become a vital tool in obstetrical examination and also in the accurate estimation of fetal gestational age. The ability to accurately determine the fetal gestational age, growth and recognizing its abnormal patterns helps us to decide if early intervention is necessary in high risk pregnancy or not. Recent studies have shown that fetal kidney length can also be used to make an accurate measurement of the fetal gestational age, particularly in the third trimester of pregnancy.<sup>1</sup> The development of diagnostic ultrasound has opened new possibilities for more confident assessment of dating. GA can be estimated in the first trimester by ultrasonic measurement of diameter and volume of gestational sac as well as crown-rump length (CRL).<sup>2-4</sup>

Although fetal biometric measurements indicate accurate indices for GA estimation in the early second trimester, the biological

diversity of size lead to change in accuracy of these parameters as the age of fetus advance and a true dating in late second or third trimester gets difficult. So, some studies are focused on the association of kidney size in a normal fetus with gestational age.<sup>5</sup> The accurate knowledge of gestational age is a keystone in an obstetrician's ability to successfully provide antepartum care to the patient and is of critical importance in ante-natal testing and successful planning of appropriate therapy or intervention.

Failure can result in iatrogenic prematurity or post-maturity which is associated with increased perinatal morbidity and mortality.

It is an investigational tool that will accurately predict the estimated date the confinement without being affected by the discrepancy of late trimester or by growth retardation of the foetus. In India, where routine early antenatal registration is not a very common phenomenon, particularly in the rural area and where illiteracy makes it difficult to elicit proper menstrual history, it is very imperative that accurate dating is favailable. Hence the foetal kidney length can be used as a valuable and easy diagnostic tool. The aim of this present study to estimate the gestational age in third trimester using mean fetal kidney length.

**MATERIAL & METHODS**

This cross section hospital based study was conducted in the department of Obstetrics and Gynecology, PBM and Associated group of hospitals, attached to S.P. Medical college, Bikaner during study period of one year from 2015 to 2016. Pregnant women (n=100) with known dates of different parity and ages were included in this study. The women were evaluated as per history, general physical examination and routine antenatal investigations and using third trimester ultrasonography. Gestational age was calculated from mean fetal kidney length using normogram by Cohen et al<sup>6</sup>. The subjects were informed about the study and informed consent was taken before they were enrolled in the study.

**RESULTS**

The present study was conducted on 100 pregnant women in their 3<sup>rd</sup> trimester who presented in antenatal clinic during 2015 to 2016.

These out of 100 patients while most of the females were in middle age group (n=90) (table 1). In this study highest gravidity notes was of 8<sup>th</sup> gravida (table 2).

In present study, gestational age was ranging from 28 to 40 weeks and their mean kidney length was ranging from 28.00 to 40.00 mm.

Maximum number of cases was found in gestational age 36 & 37 weeks (n=17 each) while least common gestational age was 39 & 40 weeks where only 1 patient was found in each (table 3).

**Table 1: Distribution of cases according to age group (years)**

| Age Group      | No. | %    |
|----------------|-----|------|
| ≤ 19 (Teenage) | 5   | 5.0% |
| 20-34 (Middle) | 90  | 90%  |
| > 34 (Elderly) | 5   | 5.0% |
| Total          | 100 | 100% |

**Table 2: Distribution of cases according to Gravida**

| Gravida | No. | %     |
|---------|-----|-------|
| Primi   | 42  | 42.0% |
| Second  | 31  | 31.0% |
| Multi   | 27  | 27.0% |
| Total   | 100 | 100%  |

**Table 3: Distribution of cases showing Kidney Length (KL) for various gestational ages**

| Gestational age in weeks (n=100) | Mean KL in mm | SD   | Median |
|----------------------------------|---------------|------|--------|
| 28 (n <sub>1</sub> =5)           | 28.00         | 0.00 | 28.00  |
| 29 (n <sub>2</sub> =2)           | 29.00         | 0.00 | 29.00  |
| 30 (n <sub>3</sub> =6)           | 29.67         | 0.51 | 29.00  |
| 31 (n <sub>4</sub> =7)           | 30.28         | 0.48 | 30.00  |
| 32 (n <sub>5</sub> =5)           | 32.00         | 0.00 | 32.00  |
| 33 (n <sub>6</sub> =9)           | 32.88         | 0.33 | 32.00  |
| 34 (n <sub>7</sub> =9)           | 33.44         | 0.52 | 33.00  |
| 35 (n <sub>8</sub> =16)          | 34.68         | 0.47 | 34.00  |
| 36 (n <sub>9</sub> =17)          | 35.76         | 0.56 | 35.00  |
| 37 (n <sub>10</sub> =17)         | 36.76         | 0.43 | 36.00  |
| 38 (n <sub>11</sub> =5)          | 37.40         | 0.54 | 37.00  |
| 39 (n <sub>12</sub> =1)          | 38.00         | 0.00 | 38.00  |
| 40 (n <sub>13</sub> =1)          | 40.00         | 0.00 | 40.00  |

**DISCUSSION**

The present study showed maximum no. of cases (90%), who were presented for study were in middle age group i.e. 20-34 years and least in elderly age group (> 34 years).

This study was mainly done to measure the normal length of fetal kidneys sonographically during 3<sup>rd</sup> trimester of pregnancies in all the cases of study. The greatest fetal kidney length of each of 100 consecutive fetuses between 27 to 40 weeks gestation was measured on sonogram. Abnormal fetuses, twins, offspring of

diabetic mothers and fetuses with renal pelvic dilatation of 4 mm or greater were excluded to avoid any questionable measurements.

The range of mean fetal kidney length was from 22 mm at 22 weeks to maximum of 39mm at 39 weeks at gestation, along with standard deviation and their 95% confidence interval. According to our study fetal kidney lengths in mm are also equal to the weeks at the particular gestational age i.e. at 22 weeks of gestational (according to PA), the fetal kidney length was 22 mm. It is also

evident from this study that as the gestational age increases, the length of fetal kidney also increases and there is significant difference in the mean fetal kidney length that is found when lengths are compared across the 22 to 39 weeks of gestational age ( $P < 0.001$ ). Kurtz et al (1988)<sup>7</sup> in their review of studies of obstetrical measurements in ultrasound, noted only two earliest studies of fetal kidney length, that used renal time equipment. Two studies i.e. Bertagnoli et al (1983)<sup>8</sup> and Lawson et al (1981)<sup>9</sup> showed their measurement almost equal to our study, and suggested a rule of thumb that is renal length in millimetres approximates gestational ages in weeks.

The study by Bertagnoli et al (1983)<sup>8</sup> and their chart were recommended. The reference articles showed, that mean length increases with gestational age. The study of Lawson et al (1981)<sup>9</sup> using articulated arm scanning, showed measurement of 32mm at 30 weeks and measurement of 42-43 mm at term, which are closer to our measurement.

The study of Cohen et al (1991)<sup>6</sup>, reported in their sonographic study of 397 obstetric patients, showed mean renal length of 27mm at 22 weeks and of 42 mm at 39 weeks of gestation. These findings are greater and confidence interval is wider than our study and previously reported.

Ansari et al (1997)<sup>10</sup> also in their sonographic study of 793 fetus for measurement of normal kidney length in Bangladesh reported that the average fetal kidney length of full term is 39.5mm. The findings are similar to our study.

According to Konje et al (1998)<sup>11</sup> the estimation of gestational age by foetal kidney length measurement was  $\pm 1$  week at 24-34 weeks of gestation and  $\pm 2$  weeks at 34-38 weeks of gestation. These findings are closely related to findings of our study.

## CONCLUSION

Kidney length is the more accurate method of determining gestational age than the fetal biometric indices between 24 and 38 weeks of gestation. It is also evident from this study that fetal kidney length increases with each week of gestation. However, large and multicentric studies are required to recommend it.

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**Source of Support:** Nil. **Conflict of Interest:** None Declared.

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**Cite this article as:** Ruchi Saxena, Gajendra Saxena, Khushboo Joshi, Sunipa, Kamlesh Yadav. Foetal Kidney Length as a Parameter for Determination of Gestational Age in Pregnancy by Ultrasonography. *Int J Med Res Prof.* 2016; 2(6):71-73. DOI:10.21276/ijmrp.2016.2.6.013