Usefulness of Ultrasonic Measurement of Fetal Kidney Length and Circumference in Estimating Gestational Age after 30 Weeks of Pregnancy

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Abstract

**Introduction:** Knowledge of gestational age is important to the obstetrician because it affects clinical management in many ways. First, this allows obstetrician to anticipate spontaneous delivery and plan delivery for the optimal perinatal outcome. Second, it helps in scheduling invasive procedures and genetic tests. Third, it helps in evaluating fetal growth because normal ranges of parameters change with advancing age. Virtually all important clinical decisions require knowledge of the menstrual age.

**Materials and Methods:** The study was conducted for a period of one and a half year from March, 2018 to July, 2019 at the department of obstetrics and gynecology, Santhiram General Hospital, Nandyal. Pregnant mothers presenting either to the outpatient department or in patients with gestational age more than 30 weeks by their LMP.

**Results:** There were 36 cases (36%) with gestational age between 30-34wks of gestation, 36 cases(36%) between 34-37wks of gestation, 28 cases(28%) between 37 -40wks of gestation. In these, there were 15 cases (15%) of pregnancy induced hypertension, 20 cases (20%) of anemia and 5 cases (5%) of intrauterine growth restriction. The mean gestational age calculated using LMP, standard biometric parameters (BPD, HC, AC and FL) and that using kidney length and circumference at 30 – 34 wks, 34 – 37 wks and 37 - 40 wks.

**Conclusion:** Women who present to the obstetrician after 30 weeks who do not recall their LMP’s or with unreliable LMP’s with no visits or ultrasound examination in early trimesters pose a great problem in assessment of gestational age which is very important in managing the obstetric cases more so high risk pregnancies.

**Key Words:** LMP, Hypertension, BPD, HC, AC, FL.
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10 days in second trimester and + or – 3 weeks in third trimester. As such, there is need for adding more parameters in the existing sonogram picture / study. Fetal kidneys can be clearly visualised delineated from other viscera by 30 weeks of gestation. Standard kidney parameter measurements like length, anteroposterior diameter, circumference and volume are easily studied through a full bladder window by abdominal probe. Therefore our present study takes up estimating gestational age using sonographic measurements of kidney length and circumference after 30 weeks of gestation using again standard parameters like BPD, HC, AC, FL and compare with gestational age calculated from menstrual history.

II. Aims And Objectives

To determine the usefulness of gestational age calculated by ultrasonic measurements of fetal kidney length and circumference after 30 weeks of gestation as compared to standard biometric parameters like BPD, HC, AC and FL.

- Estimation of gestational age using BPD, HC, AC and FL in pregnant women with gestational age more than 30 weeks.
- Estimation of gestational age using kidney length and circumference in pregnant women with gestational age more than 30 weeks.
- Comparing the above gestational ages their last menstrual period and statistical analysis of the data.

III. Materials And Methods

The study was conducted for a period of one and a half years from March 2018 to July 2019 at the department of obstetrics and gynecology, Santhiram General Hospital, Nandyal.

SOURCE OF DATA: Pregnant mothers presenting either to the outpatient department or in patients with gestational age more than 30 weeks by their LMP.

Sample size: 100 cases

INCLUSION CRITERIA:
- Pregnant mothers are selected for the study, based on the following criteria:
- Gestational age more than 30 weeks
- Reliable last menstrual period
- Irrespective of any obstetrical complications

EXCLUSION CRITERIA:
- Cases with fetal renal anomalies and twin gestation were excluded.

METHOD:

100 pregnant women attending outpatient department or in patients were included in the study based on the inclusion and exclusion criteria.

GESTATIONAL AGE:

Women with gestational age more than 30 weeks, calculated based on last menstrual period were selected for the study.

RELIABLE LAST MENSTRUAL PERIOD:

Reliability of the last menstrual period is assessed by
a) Regular last three menstrual cycles
b) No oral contraceptive or ovulation induction drugs usage

OBSTETRICAL COMPLICATIONS:

Women with gestational age more than 30 weeks taken for study irrespective of their obstetrical complications like anaemia, PIH, IUGR, hydramnios.

FETAL RENAL ANOMALIES:

Cases with fetal renal anomalies like pelvicaliceal dilatation, polycystic kidney disease, kidney length more than 7 cm, more than 2 cysts were excluded from the study.

After clinical examination and basic laboratory investigation, these women are subjected to 2D transabdominal ultrasound examination using 3.5 MHz frequency curvilinear transducer.

Fetal parameters BPD, HC, AC, FL, kidney length, kidney circumference are measured using standard criteria specified and composite gestational age is calculated using standard growth charts (CGA2 – CGA3).

Gestational age is calculated based on their last menstrual period (CGA1). Differences in the gestational age is calculated statistically analyzed.
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IV. Observations And Results

100 Antenatal women were selected and studied

a) Gravidity distribution in the study population

45 (45%) were primigravida and 55(55%) were multigravida

<table>
<thead>
<tr>
<th>PARITY</th>
<th>NO. OF CASES</th>
<th>% OF CASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMIGRAVIDA</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>MULTIGRAVIDA</td>
<td>55</td>
<td>55</td>
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</tbody>
</table>

b) Gestational age distribution in study population:

There were 36 cases (36%) with gestational age between 30-34wks of gestation, 36 cases (36%) between 34-37wks of gestation, 28 cases (28%) between 37 -40wks of gestation.

<table>
<thead>
<tr>
<th>PARITY</th>
<th>NO. OF CASES</th>
<th>% OF CASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 – 34 wks</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>34 – 37 wks</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>37 – 40 wks</td>
<td>28</td>
<td>28</td>
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c) Risk factors distribution in study population:
In these, there were 15 cases (15%) of pregnancy induced hypertension, 20 cases (20%) of anemia and 5 cases (5%) of intrauterine growth restriction.

<table>
<thead>
<tr>
<th>RISK FACTOR</th>
<th>NO. OF CASES</th>
<th>% OF CASES</th>
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<tbody>
<tr>
<td>PIH</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>ANAEMIA</td>
<td>20</td>
<td>20</td>
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<tr>
<td>IUGR</td>
<td>5</td>
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</table>

The mean gestational age calculated using LMP, standard biometric parameters (BPD, HC, AC and FL) and that using kidney length and circumference at 30 – 34 wks, 34 – 37 wks and 37 - 40 wks.

The mean gestational age calculated using LMP was 35.39 wks, it was 32.5 wks using standard parameters, it was 34.53 wks using kidney length and circumference.

<table>
<thead>
<tr>
<th>WEEKS OF USING</th>
<th>MEAN GESTATIONAL AGE</th>
<th>MEAN BPD, HC, AC AND FL</th>
<th>MEAN KC AND KL</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 - 34 WKS</td>
<td>31.67</td>
<td>30.49</td>
<td>32.3</td>
</tr>
<tr>
<td>34 - 37 WKS</td>
<td>35.5</td>
<td>32.7</td>
<td>34.01</td>
</tr>
<tr>
<td>37 - 40 WKS</td>
<td>39.02</td>
<td>34.31</td>
<td>37.3</td>
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Mean gestational age difference between CGA1 and CGA2 was 1.79 wks and between CGA1 and CGA3 was 0.72 wks.

<table>
<thead>
<tr>
<th>WEEKS OF GESTATION</th>
<th>CGA1 – CGA3 IN WKS</th>
<th>CGA1 - CGA3 IN WKS</th>
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</thead>
<tbody>
<tr>
<td>30 - 40 WKS</td>
<td>1.79</td>
<td>0.72</td>
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Though the mean gestational age difference using standard parameters and KC & KL was not statistically significant (p = 0.99) the prediction error using KC & KL is less than that of standard parameters.

V. Discussion
In the present study 100 cases were studied and the prediction error in calculating gestational age using BPD, HC, AC and FL was 1.79 wks and using KC and KL was 0.72 wks.
Study conducted by Kiran Pandey, Ajay Bhagoliwal, V.K. Singh published in Journal of Obstetric & Gynaec Ind vol. 51 Nov/Dec 2001 showed the prediction error using KC and KL was 1.5 wks.
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R² value using BPD, HC, AC and FL in the above study was 92.8% and using kidney length and circumference was 98.0%.

The present study showed R² value using BPD, HC, AC and FL and using kidney length and circumference to be 94% and 97.4%.

J. C. Konje, K. R. Abrahams S. C. Bell, D. J. Taylor (2002) published study in ultrasound in Obstetrics and Gynec 19(6), showed prediction error using kidney length was 10.29 days.

The present study showed prediction error using kidney length was 14 days.

<table>
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<tr>
<th>Study</th>
<th>Prediction Error</th>
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<tr>
<td><strong>PRESENT STUDY</strong></td>
<td>14 Days</td>
</tr>
<tr>
<td><strong>KONJE’S STUDY</strong></td>
<td>10.29 Days</td>
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Konje et al (1997) has shown that kidney length at different gestational age is not significantly different in small for date and appropriate for date babies.

Albert Chiara (1993) reported a good correlation between right kidney length, left kidney length and gestational age. The present study also showed a good correlation between mean kidney length and gestational age.

Konje et al (1997) has shown that kidney length at different gestational age is not significantly different in small for date and appropriate for date babies.

VI. Conclusion

Women who present to the obstetrician after 30 weeks who do not recall their LMP’s or with unreliable LMP’s with no visits or ultrasound examination in early trimesters pose a greater problem in the assessment of gestational age which is very important in managing the obstetric cases of those high-risk pregnancies.

These women should be subjected to transabdominal ultrasound and apart from measuring the standard biometric parameters, measurement of fetal kidney length can be included as:

- The prediction error in estimating the gestational age after 30 weeks is less than standard biometric parameters.
- Fetal kidney could be readily visualized after 30 weeks.
- Standard charts are available for the estimation of gestational age using kidney length and circumference.

References

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4. Mahoney RS, Callen PA, Filly AR. Thedistalfemoralphysis and fenotomy concentration in assessment of third trimester menstrual age: sonographic identification and measurement.
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