Estimated fetal weight (EFW) is important information to the obstetrician in and around labour to decide the mode of delivery and to anticipate problems in progress of labour as well as difficulty during delivery and neonatal period.
Estimation of Fetal Weight in peripartum period: Most Reliable Method

Devi Rajmohan, Gowri Dorairajan*, T.B.Kasthuri
Department of Obstetrics and Gynaecology, Govt. Maternity Hospital, Puducherry.
*Presently Associate Professor Indira Gandhi Medical College and RI
Corresponding Author: Dr. Gowri Dorairajan
E-mail: gowrirorai@hotmail.com

Key Words: Estimated Fetal Weight, Macrosomia, Clinical Palpation, Dare’s method, Johnson’s method

INTRODUCTION

Estimated fetal weight (EFW) is important information to the obstetrician in and around labour to decide the mode of delivery and to anticipate problems in progress of labour as well as difficulty during delivery and neonatal period. It may not be feasible or practical to apply sonographic estimation to low resource setting busy labour rooms in developing countries.

We undertook this study on 1000 pregnant ladies who delivered within 48 hours and compared accuracy of predicting EFW by ultrasound, clinical abdominal palpation and three different objective mathematical clinical formulae with the aim of finding the most reliable method of estimating fetal weight for women in the peripartum period.

MATERIALS AND METHODS:

This prospective study was undertaken from November 2005 to November 2007 at the Government Maternity Hospital Puducherry, India. The study was approved by the Institute Ethics Committee. 1000 women with singleton term gestation in cephalic presentation and delivered within 48 hrs of estimation of fetal weight were included. Cases with hydromnios, oligohydromnios, malpresentations, multifetal gestation and fibroid/adnexal mass complicating pregnancy were excluded from the study.

After emptying bladder, with the patient on her back and legs extended, symphysis-fundal height (SFH) was recorded. Abdominal girth (AG) was measured at the level of the umbilicus.
Using the arms of the external pelvimeter on the two pre-marked landmarks for symphysis-fundal height, the direct distance in centimeters was measured and taken as the longitudinal diameter of the uterus for the Dawn's formula. The maximum transverse width of the gravid uterus was first identified by palpation and pelvimeter arms were gently pressed on the points to get the transverse diameter of the uterus in centimeters. Sub-umbilical abdominal wall was pinched up and the double abdominal wall thickness was measured.

Abdominal obstetric examination was then completed. Pelvic examination was carried out to note the cervical findings, the pelvic assessment and the station of the head. Fetal weight estimation was done with the following 4 methods:-

1. Fetal weight estimated by **clinical Palpation** by Leopold's maneuvers.

2. **Dare's Formula**: \( SFH \text{ (cm)} \times AG \text{ (cm)} = EFW \text{ (gm)} \)

3. **Johnson's Formula**: \( (SFH-x) \times 155 = EFW \text{ (gm)} \)
   
   \( x = 13 \) when head is at minus station
   
   \( x = 12 \) when head is at ‘0’ station.
   
   \( x = 11 \) when head is at plus station.

   If patient’s weight is >200 pounds, subtract 1cm from SFH.

4. **Dawn’s Formula**: \( L \times \left( \frac{1}{2} \right) \times 1.44 \)

   \( L = \text{Longitudinal diameter of the uterus} \)
   
   \( T = \text{Transverse diameter of the uterus} \)

   If Double Abdominal Wall Thickness (DAWT) > 3 cm, the excess was deducted from transverse diameter and half the excess was deducted from longitudinal diameter of the uterus.
The ultrasound estimation was done using Hadlock’s reference table. All examinations were performed on Philips En Visor version C.3.1 using a 3.5MHz convex transducer.

**Actual Birth Weight (ABW)** was recorded at birth in grams, using electronic digital scale.

The comparison of the clinical mathematical and sonographic estimation was carried after the study was completed. Absolute mean error and the percentage of error was calculated. The accuracy of different methods was calculated in terms of the proportion of cases which were predicted within 5 and 10% of the actual birth weight. McNemar’s chi square test was used to study the significance of the difference in these paired proportions obtained by the various methods. In all comparisons a p value of < 0.05 was considered to be statistically significant.

**RESULTS:** The mean age was 25 years with a range of 18-37 years. 50.1 % were nulliparous ladies. The mean estimated fetal weight by the clinical palpation method was the closest to the actual birth weight. The palpation method was found to have the least percentage of error. When the prediction of birth weight within ±10% of actual birth weight is looked into it is observed that Palpation method performed better than Hadlock’s methods. This difference is statistically significant (McNemar Chi-Square= 47.08, p<0.05). (Table I).

Amongst the various clinical methods alone, palpation method was the most accurate followed by the Dares formula.

Coming to the proportion of cases estimated by the various methods for extremes of birth weights (Table II), Dare’s formula had the highest predictability within±10% of actual birth weight at 76 % for more than 3.5 Kg. All the eight cases with birth weight more than 4 Kg were accurately predicted by Johnson’s formula. Ultrasound and palpation method are
comparable at 57% and 54% respectively for predicting within±10% of actual birth weight for lower than 2.5 kg birth weight.

**DISCUSSION**

In our study we found that clinical palpation was significantly better than sonographic (79.4 vs 66.3%) methods in estimating the fetal weight ±10% of the actual birth weight in the peripartum period. Similar observations have been made by other authors (1,2,3,4). Ashrafghanjooei and colleagues (5) observed that clinical estimations are as good as Hadlock’s method for estimating fetal weight a week before delivery.

Amongst the various clinical mathematical methods we found that the Dare’s formula was significantly better than Johnson’s or Dawn’s formula. Shittu et al, (6) found Dares formula to be superior to sonographic method (Co-relation coefficient 78 vs.74). They found the rate of estimates ±10% of the actual birth weight to be 70% for Dares and 68% for Sonographic method. In our study the sonographic estimates were nearly similar but estimation within ±10%of ABW by Dare’s method was only 48%. They had studied 100 patients only and had excluded cases with anterior placenta.

Torloni et al, (7) studied 100 patients and found the rates of estimation ±10% of the actual birth weight to be 57, 61 and 65% respectively for Dare’s, Johnson’s and sonographic method. We found nearly similar rates for Dares and sonographic methods. Belete and Gyam (8) who compared Johnsons and Palpation method on 320 mothers also found low rates of estimation within 10% of ABW of 38% by Johnson’s method. In their study on 504 patients Sauceda et al, (9) found Johnson’s method to be accurate with minimal variation between observers. They had studied only Johnson’s method and they had included cases with pelvic presentation also. There has been no study in the literature comparing the five methods as in our study.
Amrita et al, (10) compared Dare’s, Johnson’s, Dawn’s and Hadlock’s sonographic methods (clinical palpation was not included). They found estimation rates within 10% of actual birth weight to be 67%, 41%, 32.5% and 62% respectively. They had studied 200 pregnant women and included cases within one week of delivery.

Looking at the extremes of birth weights, we found scan estimates to be marginally though not significantly better than clinical methods for less than 2.5Kg to 2.2 Kg range. Similar results were observed by Shittu et al (6) and Sherman et al, (1). For the more than 3.5 Kg group, we found Dare’s method to be more accurate (76 % rate of estimation within10% of actual birth weight) than other methods. Johnsons method could predict all the eight cases of birth weight >4 Kg accurately. Belete and Gyam(8) also observed that for >4Kg weight Johnson’s method had the least error and higher accuracy compared to palpation method. Khani et al, (11) also found Johnsons formula to be significantly better than sonographic method for macrosomic babies.

There are many sonographic formulae for estimating birth weight. In our study we chose the Hadlock method for sonographic estimation. Scioscia et al, (14) concluded from their study on 589 women, comparing 35 different sonographic formulae that the formula based on head-abdomen-femur measurements showed the lowest mean absolute percentage error.

Clinical palpation method can be easily taught to nurses and residents under training and corroboration with the actual birth weight during the learning phase would improve their assessment of birth weight by palpation over a period of time. Various authors(5,13,14) have observed that clinical experience or seniority does not affect the accuracy of estimation by palpation method. We feel that involving the nurses and the junior doctors for the clinical estimation by Palpation in busy labour room with low resource settings would provide a reliable prediction of baby weight. The suspected big babies can then be subjected
to more objective calculation with Johnson’s method. The suspected smaller babies can be subjected to sonographic estimation for more accurate estimation. This will help to screen out average baby weight pregnancies and help detect deviations from average weights for more intense and careful monitoring and appropriate management of labour.

**CONCLUSION:**

Clinical palpation is the most reliable method of estimation of birth weight in women in and around labour. Johnson’s method is very accurate mathematical clinical method for suspected big babies (>4Kg).

**REFERENCES:**


Table I–Comparative performance of different methods of estimating birth weight.

<table>
<thead>
<tr>
<th>Different Methods</th>
<th>Mean±Standard Error(gm)</th>
<th>Mean Percentage error±Standard Deviation</th>
<th>Proportion of cases(%) within +5%</th>
<th>Proportion of cases(%) within +10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hadlock’s</td>
<td>2889.43 ± 12.89</td>
<td>8.54 ± 7.38</td>
<td>39.4</td>
<td>66.3</td>
</tr>
<tr>
<td>Clinical</td>
<td>2918.19 ± 11.23</td>
<td>7.21 ± 6.56</td>
<td>40.7</td>
<td>79.4</td>
</tr>
<tr>
<td>Dare’s</td>
<td>3263.61 ± 15.94</td>
<td>13.60 ± 11.89</td>
<td>25.1</td>
<td>47.6</td>
</tr>
<tr>
<td>Johnson’s</td>
<td>3415.07 ± 16.44</td>
<td>17.81 ± 13.09</td>
<td>16.8</td>
<td>32.2</td>
</tr>
<tr>
<td>Dawn’s</td>
<td>3103.17 ± 24.45</td>
<td>17.66 ± 15.47</td>
<td>22.5</td>
<td>37.8</td>
</tr>
<tr>
<td>ABW†</td>
<td>2964.96 ± 13.38</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table II. Number of cases ±10% of the actual birth weight for different ranges of birth weight

<table>
<thead>
<tr>
<th>Weight Range(Kg)</th>
<th>Total number of cases</th>
<th>Hadlock’s</th>
<th>Palpation</th>
<th>Dare’s</th>
<th>Johnson’s</th>
<th>Dawn’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2.2</td>
<td>23</td>
<td>8</td>
<td>11</td>
<td>8</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>≥2.2&lt;2.5</td>
<td>69</td>
<td>44</td>
<td>39</td>
<td>13</td>
<td>8</td>
<td>26</td>
</tr>
<tr>
<td>≥2.5&lt;3.5</td>
<td>829</td>
<td>570</td>
<td>694</td>
<td>395</td>
<td>265</td>
<td>310</td>
</tr>
<tr>
<td>≥3.5&lt;4</td>
<td>71</td>
<td>40</td>
<td>46</td>
<td>55</td>
<td>38</td>
<td>25</td>
</tr>
<tr>
<td>≥ 4</td>
<td>8</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Overall</td>
<td>1000</td>
<td>663</td>
<td>794</td>
<td>476</td>
<td>322</td>
<td>378</td>
</tr>
</tbody>
</table>