Ultrasoundographic Estimation of Fetal Weight in Third Trimester Using Only Two Thigh Parameters and Isobe Algorithm

MOHAMED S. EL-SAFTY, M.D.*; MOHAMED E. IBRAHIM, M.D.*; MOHAMMED K. ETMAN, M.D.**; MOUNIR F. ELHAO, M.D.* and AHMED A. AHMED, M.Sc.*

The Department of Obstetrics & Gynecology* and Fetal Medicine Unit**, Faculty of Medicine, Ain Shams University

Abstract

Aim: To evaluate the accuracy of using 2 thigh parameters; femur length and cross sectional area of the fetal thigh by ultrasound, together with the Isobe formula for estimation of fetal body weight at third trimester, in comparison with the well established Hadlock formula.

Methods: 105 singleton pregnancies underwent sonographic fetal weight estimation within 72 hours before delivery. Patients were classified into 3 groups according to actual birth weight immediately after delivery: Average birth weight (2500 to 4000 grams), low birth weight (<2500 grams) and large birth weight (>4000 grams). The estimated fetal weight using both Hadlock and Isobe formulae were compared with actual birth weight and mean absolute percent error was calculated among the 3 groups.

Results: Percentage of cases within 10% of actual birth weight was 87.6% versus 61% with Isobe formula and Hadlock formula respectively.

Conclusion: Isobe Formula could be useful in daily clinical practice for accurate estimation of fetal weight especially in cases where head measurements are impossible.

Key Words: Fetal weight estimation – Isobe algorithm – Hadlock formula – Cross-sectional area of thigh.

Introduction

BODY weight is dependent on several factors including length of long bones along with muscle and fat mass. A number of trials were conducted to test the accuracy of fetal subcutaneous fat assessment by ultrasound to detect oversized fetuses [12].

Drawbacks of ultrasonographic Estimation of Fetal Weight (EFW) are due to intra and interobserver differences of operating the ultrasound machine. In addition formulae and software used are somewhat misleading at extremes of range of fetal weight. Abdominal Circumference (AC) is the most commonly used parameter to calculate fetal growth and weight, in spite of being the most affected by operator differences in comparison with linear measurements such as Femur Length (FL). Dimensions like Biparietal Diameter (BPD), AC and FL used in the Hadlock formula do not justify for increased lean and fat body mass causing an under calculation of fetal weight. The greatest examples of this underestimation of EFW are fetuses of diabetic mothers who suffer from increased soft tissue mass due to fetal hyperinsulinaemia [3].

In some cases where the fetal head is deeply engaged within the pelvis hinders from accurate measuring of the biparietal diameter and hence could compromise the calculation of the EFW. To overcome such problems, Isobe [4] designed a formula for estimation of fetal weight incorporating two fetal thigh dimensions using conventional two dimensional (2D) ultrasound. The CSAT is defined as the cross sectional area of the muscles and bones of the thigh on the plane at right angle to the long axis of the femur, where the area is the largest [4].

The aim of this study was to evaluate the accuracy of using 2 fetal thigh parameters; Femur Length (FL) and Cross Sectional Area of the thigh (CSAT), together with the Isobe's formula for estimation of fetal weight in the third trimester, in comparison with the Hadlock formula.

Patients and Methods

This prospective comparative study was carried out at Ain Shams Maternity Hospital, Cairo, Egypt from August 2012 until February 2013. One Hundred and five pregnant women in the third trimester
having singleton fetuses with normal amount of liquor and cephalic presentations were enrolled in the study. Women with multiple pregnancies, fetal structural anomalies, uterine anomalies, oligohydramnios and fetal malpresentations were excluded. Institutional review board approval was obtained and all patients gave a verbal informed consent for participation in the study.

Demographic data of the participants were recorded including age, parity and gestational age. Pregnancy duration given in exact weeks was calculated by 1st date of the last menstruation using Nagele's formula and confirmed by an early ultrasound scan performed during 1st trimester of pregnancy (measuring crown-rump length between 9 and 12 weeks of gestation). Ultrasound examinations for all participants were performed once within 72 hours prior to termination of pregnancy by the same sonographer (third author) in the fetal medicine unit using a trans-abdominal ultrasound with 5.0MHz convex probe (Medison SonoAce X6).

Abdominal ultrasound was performed first to confirm positive fetal life, cephalic presentation and to assess Amniotic Fluid Index (AFI). Then parameters like Biparietal Diameter (BPD), Abdominal Circumference (AC), Femur Length (FL) and Cross Sectional Area of Thigh (CSAT) were measured respectively and fetal weight was calculated using Isobe’s and Hadlock formulae. BPD was measured in the following method Fig. (1) [5]: Midline echo of the falx cerebri was brought into view designating the longitudinal axis of the fetal head and further scanning of the fetal head was continued until cavum septum pellucidum appeared and the BPD was measured from the outer edge of the anterior parietal bone till the inner edge of the posterior parietal bone in millimeters [6].

AC was measured in the following method Fig. (2) [5]: The upper fetal body is brought into view especially the fetal stomach if distended with fluid and the fetal umbilical vein, and then rotation of the probe was done to visualize a transverse section of the fetal abdomen which is usually circular or very slightly elliptical and then measured in millimeters [7].

FL was measured in the following method Fig. (3) [5]: Lower spine and iliac crest of the fetus were obtained in a longitudinal axis, and then rotation of the transducer was done to visualize the longitudinal axis of the femur after which it was measured between the greater trochanter till distal metaphysis in millimeters [6].

CSAT was measured in the following method Fig. (4) [4]: Femur was brought into view in the longitudinal axis and at the level of junction between the upper and middle parts of the femur, the probe was rotated to obtain the transverse plane for which the circumference was measured; in addition circumferences were measured 1-2cm above and below the latter level and showed very slight variation; at that level the area was calculated in mm² [4].

Participants were excluded when the above parameters could not be measured as described above.

The estimated fetal body weight was calculated twice as follow:
1- Using Hadlock’s formula, which had been calculated by the machine programmed software, using BPD, AC and FL.
2- Using Isobe’s formula, which had been calculated manually using FL and CSAT as follow:

\[
\text{EFBW} = 13 \times (\text{FL} \times \text{gCSAT}) + 39 \quad (\text{gm}),
\]

N.B.: FL by millimeter, CSAT by centimeter.

The Birth Weights (BW) of all neonates were measured immediately after delivery and after cutting of the umbilical cord and clamping it 5cm from the neonates’ abdomens without any towels or clothes or the clamp used to close the umbilical cord. The same calibrated scale was used for all neonates.

Statistical analysis was performed using Microsoft Excel version 2010 and Statistical Package for Social Sciences (SPSS) for Windows version 15.0. Data were presented as range, mean and standard deviation (for numeric variables) or number and percentage (for categorical variables). The following terms were used:
- **Error**: Difference between estimated fetal weight (by either formula) and actual birth weight. The error was positive (if overestimating) or negative (underestimating).
- **Absolute error**: The absolute value of the error (regardless its sign).
- **Absolute error percentage**: The absolute error divided by the actual birth weight, expressed as percentage. The accepted range for the absolute error percentage was set at 10% of the actual birth weight.

Actual birth weight was considered as the gold standard. Difference between actual birth weight (on one side) and EFW using either formula (on
the other side) and also between EFW using either formula was assessed using paired student’s \( t \)-test and corrected Chi-squared test. The paired difference was presented as mean difference ± standard deviation, and the corresponding 95% confidence interval. Association between two metric variables was estimated using Pearson's correlation coefficient. Significance level was set at 0.05.

**Results**

The mean age of included women was 28.65 ± 5.56 years. The mean gestational age of included women was 38.32 ± 1.72 weeks. Of the included 105 women, 31 (29.5%) were primigravidas, while 74 (70.5%) were multiparous. The mean sonographically measured fetal BPD in included women was 91.96±4.07mm. The mean fetal AC was 322.12± 23.02mm. The mean fetal FL was 74.31±4.15mm, while the mean CSAT was 11.3±2.34cm (range: 4.06-18.86cm). The mean actual birth weight in included women was 3217.8±573.03g. Of the 105 included neonates, 88 (83.8%) had average birth weight [2500-4000g], 10 (9.5%) had low birth weight [<2500g], while 7 (6.7%) had large birth weight [>4000g].

There was a significant positive correlation between actual birth weight and EFW using Hadlock’s formula and EFW using Isobe’s. The higher correlation coefficient was with EFW using Isobe's formula \([r=0.924, p<0.01]\), indicating more significant association. Using Hadlock’s formula, the mean error (from actual birth weight) was 100 ± 326.24g. The mean absolute error percentage of the actual birth weight was 8.69±5.78%. Of the included 105 women, 64 (61%) had an absolute error in Hadlock's formula-EFW within 10% of the actual birth weight, while 41 (39%) had an absolute error more than 10% of the actual birth weight (Table 1). Using Isobe's formula, the mean error (from actual birth weight) was 62.161 ± 230.37g. The mean absolute error percentage of the actual birth weight was 6.62±6.34%. Of the included 105 women, 92 (87.6%) had an absolute error in Isobe's formula-EFW within 10% of the actual birth weight, while 13 (12.4%) had an absolute error more than 10% of the actual birth weight (Table 2).

The mean paired difference between EFW using Hadlock's formula and actual birth weight was −100.07±326.24g [95% CI (−163.21 to −36.94g); \( p=0.002 \)]. The mean paired difference between EFW using Isobe's formula and actual birth weight was 62.16±230.37g [95% CI (17.57 to 106.74g); \( p=0.007 \)]. The narrower 95% CI and the high \( p \)-

value for the Isobe's formula when compared to Hadlock's formula denoted closer values of the estimated fetal weight to the actual birth weight using the former formula than the latter one. Of note, the mean paired difference was positive in Isobe formula (i.e. the error is toward overestimation) while Hadlock formula had a negative mean for the paired difference (i.e. the error is toward underestimation). The absolute error percentage of Hadlock's formula mean was 8.69% ± 5.78 while it was much lower for Isobe's formula 6.62% ± 6.34%. The mean paired difference was highly statistically significant \( p=0.008 \).

Isobe formula error percentage identified a total of 92 case within 10% of the actual birth weight, 59 (64.1%) of them were only identified by Hadlock while 33 (35.9%) fell into more than 10% error from actual birth weight. In addition Isobe formula identified a total of 13 cases with error more than 10% of actual birth weight 8 (61.5%) out of the 13 were identified by Hadlock formula and only 5 (38.5%) were considered within 10%. This correlation was statistically insignificant. This was further shown by the lower mean absolute error percentage of the actual birth weight of Isobe formula versus Hadlock formula [6.62±6.34% vs. 8.69±5.78%, respectively, \( p=0.08 \)] and the lower proportion of women who had their EFW absolute error > 10% of the actual birth weight [13 (12.4%) vs. 41 (39%), respectively, \( p=0.076 \)] with Isobe's formula when compared to Hadlock's formula (Table 3).

Further analysis after splitting cases according to the birth weight categories (average, low or large birth weight) showed that EFW using either Hadlock's or Isobe's formulae was significantly positively correlated to the actual birth weight in all weight categories; yet Isobe's formula had highest correlation coefficient in large birth weight categories, and much higher coefficient in low birth weight categories. Among the average birth weight category, the mean paired difference was lower when Isobe's formula rather than Hadlock's formula was used [−36.46 ± 188.98g vs. 90.15 ± 322.48g]. The difference was positive in Hadlock's formulae [denoting an overestimating error] while negative in Isobe's formula [denoting an underestimation error]. Among the low birth weight category, Isobe formula had mean paired difference markedly higher than that noticed among the average birth weight category, and it was noted that the Hadlock's formula had negative mean paired difference while it was positive in average birth weight. In addition Hadlock's formula had lower mean paired difference and tight range when com-
pared to the Isobe's formula [85.4±209.3g vs. -455.7±200.26g]. The mean was negative in both formulae [denoting an underestimating error]. Among the large birth weight category, Hadlock's formula had mean paired differences markedly higher than that noticed among the average birth weight category, and it was noted that Isobe's formula had positive and higher mean paired difference when compared to that of average birth weight. Both Hadlock's formula and Isobe's formula had positive mean paired difference [489.7±187.86g vs. 177±85.9g]. The difference was positive in both formulae [denoting an overestimating error]. Among the average actual birth weight category, the absolute error % of the actual birth weight for the EFW was significantly lower with Isobe's formula when compared to Hadlock's formula [5.16 ±3.22% vs. 8.37±6.07%, respectively, p=0.000]. Among the low actual birth weight category, the absolute error % of the actual birth weight for the EFW was significantly lower with Hadlock's formula when compared to Isobe's formula [10.21 ±3.81% vs. 21.46±9.48%, respectively, p=0.004]. Among the large actual birth weight category, the absolute error % of the actual birth weight for the EFW was significantly lower with Isobe's formula when compared to Hadlock's formula [3.87±1.86% vs. 10.59±3.59%, respectively, p=0.003]. Among average birth weight cases, Isobe formula error percentage identified a total of 83 case within 10% of the actual birth weight, 56 (67.5%) of them were only identified while 27 (32.5%) fell into more than 10% error from actual birth weight by Hadlock's formula. In addition Isobe formula identified a total of 5 cases with error more than 10% of actual birth weight 3 (60%) out of the 5 were identified by Hadlock formula and only 2 (40%) were considered within 10%. This correlation was statistically insignificant. Among low birth weight cases, Isobe formula identified 2 cases within 10% of the actual birth weight, from which one was identified within 10% of actual birth weight and the other in >10% of actual birth weight by Hadlock's formula. In addition Isobe formula identified a total of 8 cases with error more than 10% of actual birth weight 5 (62.5%) out of the 8 cases were also identified by Hadlock formula and 3 (37.5%) were considered within 10%. This correlation was statistically insignificant. Among large birth weight cases, Isobe formula identified all 7 cases of large birth weight as within 10% of actual birth weight; that is why analysis using Corrected Chi-squared Test could not be applied. Hadlock's formula matched Isobe formula in only 2 cases (28.6%) and identified the remaining 5 (71.4%) as >10% of actual birth weight (Table 4).
Mohammed S. El-Safty, et al.

**Fig. (3A):** Femur length (FL) [8].

**Fig. (3B):** Fetal FL of one of the included women.

**Fig. (4A):** Echographic features in the plane of the largest cross sectional area perpendicular to the long axis of the thigh. Four hyperechogenic portions are thought to indicate femoral bone and tissues between muscles (vastus, rectus, biceps and adductor) [4].

**Fig. (4B):** Fetal CSAT of one of the included women.

**Fig. (4C):** Fetal CSAT of one of the included women.

**Table (1):** Estimated fetal weight using Hadlock formula.

| Hadlock's formula | EFW (g): | Range          | 1789-4258 |
|                  |          | Mean ± SD      | 3117.73±493.74 |
| **Error (g):**   |          | Range          | -791-640 |
|                  |          | Mean ± SD      | -100±326.24 |
| **Absolute error % of actual birth weight:** |          | Range          | 0-23.26 |
|                  |          | Mean ± SD      | 8.69±5.78 |
| **Absolute Error [No. (%)]:** |          | Within 10% of actual birth weight | 64/105 (61%) |
|                  |          | >10% of actual birth weight | 41/105 (39%) |

**Table (2):** Estimated fetal weight by Isobe’s formula.

| Isobe's formula | EFW (g): | Range          | 1690-4660 |
|                |          | Mean ± SD      | 3279.97±458.74 |
| **Error (g):** |          | Range          | -383-773 |
|                |          | Mean ± SD      | 62.16±230.37 |
| **Absolute error % of actual birth weight:** |          | Range          | 0.17-32.97 |
|                |          | Mean ± SD      | 6.62±6.34 |
| **Absolute error [No. (%)]:** |          | Within 10% of actual birth weight | 92/105 (87.6%) |
|                |          | >10% of actual birth weight | 13/105 (12.4%) |

EFW estimated fetal weight.
Table (3): Cross tabulation between Hadlock's and Isobe's formula errors %.

<table>
<thead>
<tr>
<th>Hadlock's formula</th>
<th>Within 10% of actual birth weight</th>
<th>&gt;10% of actual birth weight</th>
<th>Total</th>
<th>χ²</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isobe formula:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within 10% of actual birth weight</td>
<td>59/92 (64.1%)</td>
<td>33/92 (35.9%)</td>
<td>92</td>
<td>3.15</td>
<td>0.076*</td>
</tr>
<tr>
<td>&gt;10% of actual birth weight</td>
<td>5/13 (38.5%)</td>
<td>8/13 (61.5%)</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>41</td>
<td>105</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*: Analysis using corrected chi-squared test.

Table (4): Difference between estimated fetal weight using Hadlock's and Isobe's formula and actual birth weight among actual birth weight categories.

<table>
<thead>
<tr>
<th></th>
<th>Paired difference (mean ± SD)</th>
<th>95% CI of the mean paired difference</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average birth weight:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EFW using Hadlock's formula actual birth weight</td>
<td>90.15±322.48</td>
<td>21.83-158.48</td>
<td>0.01 S</td>
</tr>
<tr>
<td>EFW using Isobe’s formula actual birth weight</td>
<td>−36.46±188.98</td>
<td>−76.5 to 3.57</td>
<td>0.004 HS</td>
</tr>
<tr>
<td>Low birth weight:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EFW using Hadlock's formula actual birth weight</td>
<td>−85.4±209.3</td>
<td>−235.1 to 64.3</td>
<td>0.229 NS</td>
</tr>
<tr>
<td>EFW using Isobe’s formula actual birth weight</td>
<td>−455.7±200.26</td>
<td>−598.9 to −312.43</td>
<td>0.000 HS</td>
</tr>
<tr>
<td>Large birth weight:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EFW using Hadlock's formula actual birth weight</td>
<td>489.7±187.86</td>
<td>315.9 to −663.45</td>
<td>0.002 HS</td>
</tr>
<tr>
<td>EFW using Isobe’s formula actual birth weight</td>
<td>177±85.9</td>
<td>97.5 to −256.4</td>
<td>0.002 HS</td>
</tr>
</tbody>
</table>


Discussion

The current study aimed to assess the accuracy of the Isobe’s formula for birth weight prediction, comparing it with Hadlock’s formula using the actual birth weight as the gold standard parameter. There was a significant positive correlation between actual birth weight and each of EFW using Hadlock’s formula and EFW using Isobe’s formula. The higher correlation coefficient was with EFW using Isobe’s formula \( r=0.924, p<0.001 \), indicating a more significant association.

In the current study, a larger number of cases were recruited compared to the study of Isobe [4]. Of the recruited 105 women, the percentage of cases in which the estimated fetal weight was within 10% of the actual birth weight using Hadlock’s formula was 61% (64 cases), while with Isobe’s formula was 88% (92 cases). Regarding the Isobe study [4], it was 81% and the study of Saqib et al., [8] was 90%. The correlation coefficients of the Isobe's formula were 0.879 and 0.910, while the Aoki's formula were 0.909 and 0.932 in the study of Isobe [4] and the study of Saqib et al., [8] respectively, whereas the correlation coefficients in current study were 0.924 with the Isobe’s formula and 0.823 with the Hadlock formula; Isobe’s formula was highly correlated to actual birth weight in the three studies and it was superior in the current study than Hadlock’s formula.

The Isobe’s formula utilizes the square root of the CSAT, decreases the error of the final equation if the reference plane was not measured perfectly. As an example; if the CSAT is 9cm, the square root is 3, and if it is 10cm, the square root is 3.17, so the final equation will differ in 100-150 grams which is quite acceptable for intra-operator variation [4].

Degani [9] concluded that measuring of the femur length was very simple and handy for inexperienced operators while images of circumferences were sub-optimal even with well trained sonographers. Furthermore, Dudley and Chapman [10] compared simplicity of measuring linear biometry with circumferences and concluded the same. They
also showed discrepancies of measurements that were drawn from sub-standard ultrasound images which led to inter-operator variations causing differences in EFW. Isobe’s study [4], measurement of FL and CSAT for the same participant was performed 15 times by the same sonographer. CSAT was also evaluated twice at intervals in 15 different participants. Variations between measurements were little (correlation coefficient 0.998; standard error 0.164).

In the study of Saqib et al., [8] and in the current study, only one sonographer performed the scan for all the participants once and took a single measurement. Measurements by multiple sonographers cause changes between estimated and actual birth weight [11].

Isobe [4] and Saqib et al., [8] had the same design as the current study, but they did not assess the validity of the new Isobe’s formula on different birth weight categories. Among the average and large actual birth weight categories, the absolute error % of the actual birth weight for the EFW was significantly lower with Isobe’s formula when compared to Hadlock’s formula, but among low birth weight category, it was lower with Hadlock’s formula than Isobe’s formula, considering the sample size of each group. Of note, among the average birth weight category, the mean paired difference was positive in Hadlock’s formula (i.e. the error is toward overestimation) while Isobe’s formula had a negative mean for the paired difference (i.e. the error is toward underestimation). Both formulae had an error toward underestimation and error towards overestimation, among the low birth weight and large birth weight categories respectively. Furthermore, analysis using corrected Chi-squared test was applied to figure correlation between Isobe’s formula and Hadlock’s formula; this was statistically non-significant among the average and low birth weight categories and statistically inapplicable among the large birth weight category (as all 7 cases in this category were within 10% of actual birth weight using Isobe’s formula).

Lee et al., [12] compared new formulae using fetal thigh circumference with the Hadlock formula 20 out of 30 fetuses were within 5% of actual birth weight using the new formula; 6 out of 30 fetuses were within 5% of actual birth weight using Hadlock formula. In the current study, the study of Isobe [4] and the study of Saqib et al., [8], conventional 2-D ultrasound had been used. The derived formula of Isobe in the current study was also superior to the widely used Hadlock’s formula, as the absolute error within 10% of actual birth weight was 87.6% with Isobe’s formula and 61 % with Hadlock’s formula. However, no previous studies have been conducted to test the accuracy of Isobe’s formula using 3-D ultrasound. In addition, not all centers are equipped with 3-D ultrasound machines. Moreover, not many ultrasonographers and doctors are well-trained in 3-D ultrasound [18].

Lee et al., [12] and Lindell & Marsal [14] measured the cross-sectional area of the thigh by placing the measuring ellipse on the outside of the skin including subcutaneous tissue of the thigh. However, Isobe [4], Saqib et al., [8] and the current study, cross-sectional area of the muscles and bone of the thigh was measured excluding the subcutaneous tissue, because measuring from the external border of the skin caused sonographic blurring of the skin outline.

Acknowledgements:

Conflicts of Interest Authors declare that there are no conflicts of interest.

References


الملخص العربي

الهدف من الدراسة: تقييم دقيقة تقدير وزن الجنين بواستعمال الموجات فوق الصوتية باستخدام قياسين لطول الفخذ وطول عظام الفخذ والمنطقة المقطعة من الفخذ مع صيغة أيروب في المرحلة الثالثة من الحمل ومقارنتها بصيغة هابولوك.

المرجع وطريقة الدراسة: شملت هذه الدراسة 165 سيدة من السيدات الحوامل حوالي الحمل المنفر. في الوقت الأخير من الحمل واللائي تم عمل فحص لحول الموجات فوق الصوتية لتقييم وزن الجنين بواسطة صيغة أيروب وصيغة هابولوك في غضون 72 ساعة قبل الولادة.

تم تقسيم السيدات إلى 3 مجموعات حسب الوزن الفعلي للطفل بعد الولادة مباشرة إلى:
• أطفال ذوي وزن ضمن المعدل الطبيعي (من 2500 إلى 4000 جرام)
• أطفال ذوي وزن أقل من المعدل الطبيعي (أقل من 2500 جرام)
• أطفال ذوي وزن أعلى من المعدل الطبيعي (أكثر من 4000 جرام)

تم مقارنة الوزن التقديرلي للأجنة مع الوزن الفعلي للأطفال.

النتائج: كانت نسبة المواليد المحسوب وزنها باستخدام صيغة هابولوك ولا يزيد ارتفاعها 10% عن الوزن الفعلي 41.8% أما المواليد المحسوب وزنها باستخدام صيغة أيروب ولا يزيد ارتفاعها 10% عن الوزن الفعلي فقد كانت 87.6%.

الاستنتاج: تعد صيغة أيروب طريقة مفيدة وعملية في الممارسة الأكليكيكية اليومية لحساب وزن الجنين بدقة خصوصاً في الحالات التي يصعب فيها قياس أبعاد رأس الجنين.