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ORIGINAL ARTICLE

Accuracy of Sonographic Fetal Weight Estimation in Bangladesh

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KEY WORDS
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Objective: This study was conducted to determine the accuracy of estimated fetal weight (EFW) by ultrasound, compared with birth weight (BW), in Bangladesh.
Methods: This is a prospective, cross-sectional study on well-dated singleton fetuses. The accuracy of weight-prediction formula is determined by assessing how well the formula works in a group of fetuses scanned close to delivery. Results of previous studies were compared with those of this study.
Results: A total of 73 infants were included in the analysis to determine the accuracy of EFW. The mean absolute difference between ultrasound EFW and BW was −64.5 (±218.5) g, and the mean relative difference or the mean percentage error of fetal weight estimation was −1.4% (±7.6%).
Conclusion: Ultrasound is a reliable modality for estimating fetal weight in a Bangladeshi population using the head circumference, femur length, and abdominal circumference formula of Hadlock.

Introduction

The accuracy of a fetal weight-prediction formula is determined by assessing how well the formula works in a group of fetuses scanned close to delivery. An important measure of a formula's performance is its 95% confidence interval (CI). If the 95% CI is ±18%, then the estimated fetal weight (EFW) will fall within 18% of the actual weight in 95% of cases, and the error will be >18% in only 5% of cases. The accuracy of weight-prediction formulas improves as the number of measured body parts increase up to three, achieving greatest accuracy when measurements of the head, abdomen, and femur are used. Even when based on measurements of the head, abdomen, and femur, sonographic weight prediction has a rather wide 95% CI of at least ±15% [1].

Conflicts of interest: The author declares no conflicts of interest.

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The accuracy of sonographic measurements has been questioned due to large interobserver variations [2]. One point, however, is that the abdominal circumference (AC) measurement has the greatest interobserver and intraobserver variability of all measurements reported in the literature [3] and it is an important part of all the EFW formulas. Accuracy appears to be less in fetuses that weigh <1000 g than in larger fetuses [4]. Weight prediction is less accurate in diabetic than in nondiabetic mothers. In diabetic mothers, for measurements of the head, abdomen, and femur, the 95% CI is ±24%, whereas it is ±15% in the general population [5].

In a previous study, calculated weights from a 90-second single-shot fast spin-echo sequence magnetic resonance imaging acquisition with 8-mm-thick slices in the axial plane at term were better than ultrasonography estimates by Hadlock's formula [6].

Breech babies weighing >4 kg at birth have three to six times the perinatal mortality rate of breech babies weighing 2.5–4 kg, and therefore, there is a need for an accurate fetal weight estimate in late pregnancy, especially in patients with breech presentations [7].

This study was therefore conducted to determine the accuracy of fetal weight estimation in Bangladesh using the head circumference (HC), femur length (FL), and AC formula of Hadlock.

Participants and methods

This was a prospective, cross-sectional study. Healthy gravid women who met the following criteria were included in the study: regular periods; sure last menstrual period (LMP) date; an ultrasound scan before 20 weeks that confirmed the LMP age within 10 days; no maternal medical, surgical, or obstetric complication or malnutrition; no uterine anomaly or large fibroid; and no congenital anomaly of the fetus.

Ultrasound scans were done using a 3.5-MHz curvilinear transducer. The measurements were made using electronic calipers in millimeters. All fetuses had ultrasonographic measurements of HC, AC, and FL by standard methods. The HC was obtained at a level that showed a smooth symmetric head, a well-defined midline echo, thalami, the cavum septum pellucidum, and the third ventricle. To obtain an accurate HC measurement, 60–70% of the skull outline should be displayed on the screen. The technique of measuring the FL involves an initial determination of the lie of the fetus and locating the femur. The calcified portion is then measured. After 32 menstrual weeks, the distal femoral epiphysis is visible but not included in the measurements.

The fetal AC was measured at the level where the right and left portal veins were continuous with one another, appearing like a "J shape," and the shortest length of the umbilical segment of the left portal vein was depicted. The fetal stomach represented a secondary landmark. The ellipse of the electronic calipers was then fitted to the outer skin edge.

EFWs were expressed in grams. Calculated EFWs were compared with the birth weights (BWs) of the infants to determine the accuracy of this method of estimation. EFWs were derived from the measurements of HC, FL, and AC. Once included in the study, no patient was excluded later on. After collecting the BWs of the fetuses delivered within 72 hours of the last ultrasound scan, the comparison was made. Adjustment for days was not made. The new born babies' BWs were obtained within half an hour of delivery and were measured on an analog scale that was available in the hospital at that time. SPSS (SPSS Inc., Chicago, IL, USA) was used for data entry and analysis in the computer. Paired *t* test was used to compare EFWs and BWs, in order to determine the accuracy of the EFWs. The mean values and standard deviations (SDs) were calculated.

Results

A total of 73 infants were included in the analysis to determine the accuracy of EFWs. The mean interval from ultrasound examination to delivery was 1.59 (1SD = 1.15; range, 0–3) days. Fetal weight estimation was made using Hadlock et al's [5] formula of HC/FL/AC. The mean gestational age at delivery was 37.4 (SD = 1.98; range, 32–41) weeks (Table 1).

Using Hadlock et al's method, the mean EFW was 2753.4 (±716.4; range, 1200–4184) g, which was not significantly different from the mean actual BW of 2817.9 (±783.0) g. The actual BWs ranged from 1200 g to 4500 g. The mean EFW was 65 g less than the mean BW. A good correlation was found between sonographic EFW using the HC/FL/AC formula and actual BW ($r = 0.961$).

The mean absolute difference between EFW and BW was −64.5 (±218.5) g (95% CI of the difference, −116.2 g to −12.7 g), and the mean relative difference or the mean percentage error of fetal weight estimation [100 (EFW − BW)/BW] was −1.4% ± 7.6% (Table 2). Table 1 shows the descriptive statistics.

Table 1 Descriptive statistics.

Variables ($n = 73$)	Minimum	Maximum	Mean	SD
Estimated fetal weight (g)	1200	4184	2753.42	716.4
Birth weight (g)	1200	4500	2817.89	783.04
Gestational age (wk)	32	41	37.42	1.98
Growth percentile	3	97	50.19	22.80
Gap of days	0	3	1.59	1.15

SD = standard deviation.

Table 2 Differences between estimated fetal weights and birth weights in 73 neonates.

Variables ($n = 73$)	Values (mean ± SD)	p
Gestational age (wk)	37.4 ± 2.0	
Birth weight (g)	2817.9 ± 783.0	
Estimated fetal weight (g)	2753.4 ± 716.4	
EFW − BW (g)	−64.5 ± 218.5	> 0.05
100(EFW − BW)/BW (%)	−1.4 ± 7.6	
Correlation coefficient (r)	0.961	< 0.001

BW = birth weight; EFW = estimated fetal weight.