

Original Article

Accuracy of Clinical And Sonographic Estimation of Fetal Weight in The Third Trimester of Pregnancy

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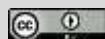
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International License](https://creativecommons.org/licenses/by/4.0/).**ABSTRACT**

Introduction: Accurate estimation of fetal weight is most important when dealing with high-risk populations, particularly when dealing with the two extremes of birth weight. Ultrasound has been used to estimate fetal weight for over 30 years. It guides clinicians to finalize important obstetrical decisions. **Aim of the study:** The study aimed to assess the accuracy of clinical and sonographic estimation of fetal weight in the third trimester of pregnancy. **Methods & Materials:** This cross-section study was conducted at the Department of Obstetrics & Gynecology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh. The study was carried out from February 2012 to July 2012. A total of 175 cases were enrolled as per inclusion criteria. **Result:** In this study, 7.4% patients was overweight or obese. The mean BMI was $22.67 \pm SD$. The mean symphysis-

fundal height (SFH) was 35.6 ± 1.2 cm. In the majority (86.3%) of cases, was at or above the ischial spine and 13.7% below the ischial spine. Regarding clinical and USG estimated fetal weights, and actual birth weight, (the mean) was 3109.71 gm (range: 2800-3600 gm), while the estimated birth weights by clinical and ultrasonographic surrogates were 3637.54 gm (range: 3100-4030 gm) and 3286.28 gm (range: 3000-3900 gm) respectively. **Conclusion:** The clinical estimation of fetal weight is one of the important and necessary skills in the management of obstetric patients because of its simplicity. But clinical estimation lies far from the approximation of the actual birth weight. Ultrasonographic estimation of the fetal

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Keywords: *Ultrasonography, Symphysis-fundal height (SFH), Shepard Formula, Johnson Formula*

INTRODUCTION

Estimation of fetal weight is essential in daily obstetric practice particularly close to term. It guides clinicians to finalize important obstetrical decisions. Low birth weight and excessive fetal weight at delivery both are associated with an increased risk of maternal and neonatal complications during labor and during puerperium ^{[1][2][3]}. Estimated fetal weight is taken into consideration when making clinical decisions involving induction or delay of labor and method of delivery ^[4]. Clinicians are becoming increasingly reliant on imaging, largely as a consequence of advances that have been made in ultrasound technology ^[5]. The fundamental underlying presumption is that the sonographic measurements of multiple linear and planar dimensions of the fetus provide sufficient information. A study evaluated the advantage of multiple ultrasonographic examinations compared with a single examination to estimate fetal weight. The accuracy of birth weight percentile predictions was more or less similar whether one or multiple such examinations were performed during the third trimester ^[6]. From its inception, ultrasound estimation of fetal weight allowed for the accurate algorithmic reconstruction of the three-dimensional fetal volume of varying tissue density ^[7]. However, sonographic assessment in many circumstances may not be done more accurately than clinical palpation in assessing fetal weight ^{[8][9]}. Both clinical palpation and ultrasound assessment of fetal weight are the least accurate at the extremes of birth weight ^[10]. To improve the accuracy of fetal weight prediction,

various fetal anatomical measurements have been used either alone or in combination. An author suggested in a study that, a formula based on biparietal diameter (BPD) & abdominal circumference (AC) accurately predicts fetal weight within 10% of actual weight ^[11]. Birth weight is the principal variable affecting fetal and neonatal morbidity, especially in preterm and small-for-dates fetuses. It is also of value in the management of breech presentations, diabetes, a trial of labor, macrosomic fetuses, and twins. Clinical estimation of fetal weight using abdominal palpation is within 500 g in 85% of cases, with more accuracy in the average, term fetus than in the preterm and macrosomic fetus ^[12]. There is a need to use a formula that gives similar results in all fetal weight groups. Both Hadlock formulas showed the most stable results in all of the weight groups. It does not correspond with another study, where the Hadlock formula was found to be less accurate than Campbell and Shepard's formulas. Campbell's formula had a lower absolute percentage error than Hadlock's formulas ^[13]. Another study reported in their results that, Shepard and Merz formulas cannot be used for fetal weight estimation when a fetus is supposed to be small (under 3000 g). Both formulas overestimate fetal weight systematically by more than 5%, and the Merz formula is even more than 15% and has an unacceptable high absolute percentage error (APE) ^[14]. Another study found that the presence of oligohydramnios caused a significant underestimation of fetal weight. Moreover, fetal growth patterns (small-for-

gestational-age or macrosomia) and fetal head shape (cephalic index) did significantly affect the accuracy of fetal weight estimation [15]. However, several other studies had shown that neither maternal obesity nor variation in amniotic fluid volume influenced the accuracy of EFW [16]. This study aimed to assess the accuracy of clinical and sonographic estimation of fetal weight in the third trimester of pregnancy.

OBJECTIVES

General Objective

- To assess the accuracy of clinical and sonographic estimation of fetal weights in 3rd trimester of pregnancy.

Specific Objectives

- To estimate the fetal weight clinically by measuring the fundal height from the symphysis pubis.
- To estimate fetal weight ultrasonographically using the Shepard formula.
- To find the difference between the USG-guided fetal weight and the actual weight (simple error).
- To find the difference between clinically predicted fetal weight and the actual weight (simple error).

METHODS & MATERIALS

This cross-sectional study was conducted at the Department of Obstetrics and Gynecology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh. The study was carried out from February 2012 to July 2012. A total of 175 cases were enrolled as per inclusion criteria. A

complete history was taken either from the patient or accompanying attendants. Predelivery symphysis-fundal height was used as a predictor of fetal weight. Relevant investigation reports were collected. All the information was collected in a pre-designed questionnaire. The differences between the USG predicted fetal weight and the actual weight (simple error) were recorded as errors in grams. Collected data was classified, edited, coded, and entered into the computer for statistical analysis by using SPSS version 11.5. Informed written consent was taken from all patients. All the data were kept confidential and used only for this study purpose. Ethical clearance was obtained from the ethical committee of the Dhaka Medical College Hospital.

Inclusion Criteria

- Women with full-term pregnancies and singleton.
- Women having vertex presentation of the fetus.

Exclusion Criteria

- Women having breech or shoulder presentation of the fetus.
- Women having fetal anomaly.
- Women with oligohydramnios.
- Women with polyhydramnios.
- Women with multiple pregnancies.
- Women having medical disorders like GDM, essential HTN, pre-eclampsia.

RESULTS

In this study, 45.2% of the patients were below 25 years of age, 31.4% between 25-30 years, and the rest 23.4% were in the

more than 30 years age group. The mean age of the patients was $26.21 \pm \text{SD}$ years and the youngest and the oldest patients were 19 and 36 years respectively (Table I).

Table I: Distribution of patients by age (N=175)

Age group (years)	N	%
<25	79	45.2
25-30	55	31.4
>30	41	23.4
Total	175	100.0
Mean (\pm SD)	26.21 (\pm 4.44)	19-36

A small proportion of patients was overweight or obese (7.4%) in terms of body mass index (BMI). The mean BMI was $22.67 \pm \text{SD}$ (Table II).

Table II: Distribution of patients by BMI (N=175)

BMI (kg/m^2)	N	%	Mean \pm SD
Normal (18.9-24.9)	162	92.6	22.67 \pm 1.21
Overweight & obese (>25)	13	7.4	

Mean symphysio-fundal height (SFH) was 35.6 ± 1.2 cm (Table III). In the majority (86.3%) of cases the level of the vertex was at or above the ischial spine and 13.7% below the ischial spine (Table IV).

Table III: Variable used in the clinical estimation of fetal weight (N=175)

Variables in the clinical estimation of fetal weight	N	Mean \pm SD
Symphysis-fundal height (cm)	-	35.6 \pm 1.2

Table IV: Level of vertex of the study population (N=175)

Level of vertex	N	%
At or above the ischial spine	151	86.3
Below ischial spine	24	13.7

Regarding clinical and USG estimated fetal weights, and actual birth weight, (mean) was 3109.71 gm (range: 2800-3600 gm), while the estimated birth weights by clinical and ultrasonographic surrogates were 3637.54 gm(range: 3100-4030 gm) and 3286.28 gm (range: 3000-3900 gm) respectively (Table V).

Table V: Different surrogates used to estimate the birth weight and actual birth weight (N=175)

Surrogates (g)	Mean ± SD	Range
Actual birth weight	3109.71 ± 192.28	2800-3600
Clinically estimated fetal weight	3637.54 ± 167.41	3100-4030
USG estimated fetal weight	3286.28 ± 182.05	3000-3900

Concerning the obstetric history, nearly 37% of patients were primigravida and 63% were multi-gravida (Figure 1). The clinical surrogate (Johnson formula) overestimated fetal weight by 17.7%, while the Shepard (BPD, AC) used for ultrasonographic estimation, overestimated fetal weight by 5.3% (Figure 2).

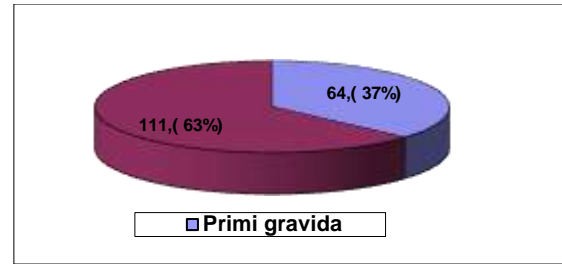


Figure 1: Distribution of patients according to obstetrics history (N=175)



Figure 2: Percentage of actual birth weight overestimated

Concerning the accuracy of the two surrogates in predicting fetal weight within 10% and 15% of the actual birth weight. About 65% and 85% of the ultrasonographically estimated fetal weight lie within 10% and 15% of the actual weight respectively which were 5.6% and 16.9% in clinical estimation respectively (Figure 3).

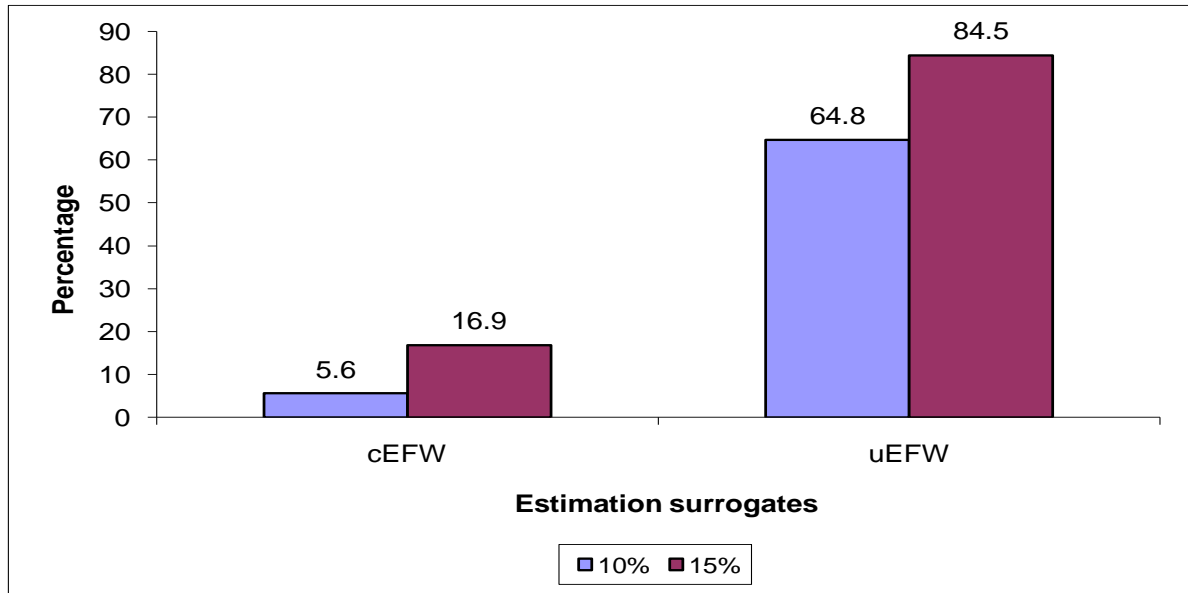


Figure 3: Accuracy of Shepard formula used to predict fetal weight (N=175)

DISCUSSION

In this study, 45.2% of the patients were below 25 years of age, 31.4% between 25-30 years, and the rest 23.4% were in the more than 30 years age group. The mean age of the patients was $26.21 \pm SD$ years and the youngest and the oldest patients were 19 and 36 years respectively. Nearly 76.5% of the patients were below 30 years old with the mean age of the patient being $26.21 (\pm 4.44)$ years. In another study, it was estimated that the maximum number of patients belonged to the 26-30 years age group with the mean age of the patients being 26.8 ± 4.7 years. The mean gestational age of the patients was 35.9 ± 2.8 weeks which is similar to the current study [17]. In this study, the mean symphysis-fundal height was 35.6 ± 1.2 cm. The mean clinically and ultrasonographically estimated fetal weights and actual birth weight were 3637.54, 3286.28, and 3109.71 g respectively. By clinical measurement, 17.7% of the fetal weight was overestimated, while by ultrasonographic

estimation, 5.3% was overestimated. In the present study, about 65% and 85% of the ultrasonographically estimated fetal weights were observed to lie within 10% and 15% of the actual birth weight respectively which in the clinical estimations were at a much lower level (5.6% and 16.9% respectively). In another study, it has been found clinically EFW to be 3432.1 ± 410.1 g and uEFW to be 2715.4 ± 509.1 g which showed that the actual BW recorded after delivery of the fetus is closer to uEFW than clinically EFW which is consistent with the present study [17]. Another author defined the mean error of both methods to be about 265g (264.7 and 265.0 g) or 9% of the actual weight which was also similar to the present study as other studies [18]. A recent systematic review of sonographic estimation of fetal weight concluded using the Shepard formula based on AC and FL, 74% of the sonographically EFWs were within 10% of the birth weight which goes in favor of the findings of the present study [11]. Clinical estimation by external

palpitation of fetal parts and uterine contour is easy to practice, inexpensive, and reliable so that 69% of estimation falls within 10% of actual birth weight. There are many clinical methods, such as symphysis-fundal height or abdominal girth, but no supporting data of any superior techniques over abdominal palpitation using the Leopold maneuver [19]. On the other hand, when examining the mean percentage errors, ultrasound appears to perform better than the clinical estimates, with significantly lower mean percent errors [20].

Limitations of The Study

The study was conducted in a single hospital with a small sample size for a short duration. So, the results may not represent the whole community.

CONCLUSION

The clinical estimation of fetal weight is one of the important and necessary skills in the management of obstetric patients because of its simplicity. But clinical estimation lies far from an approximation of the actual birth weight. Ultrasonographic estimation of the fetal weight lies near the actual birth weight. Therefore, the estimation of fetal weight for the clinical decision should always be guided by ultrasonographic measurement.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

RECOMMENDATION

Although USG has provided the best values in fetal weight estimation, in a few studies it was reported that the predictive

performance of both methods is limited. So, to get robust data further studies should be carried out. Moreover, there is insufficient evidence to determine whether SFH measurement is effective in detecting IUGR. SFH is a good option in predicting normal fetal growth, but it is less sensitive than USG for the diagnosis of small-for-age (SGA) infants and even for macrosomia.

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