

## COMPARATIVE STUDY TO ASSES THE ACCURACY OF ESTIMATED FOETAL WEIGHT (EFW) BY ULTRASONOGRAPHY AND CLINICAL METHOD USING JOHNSON'S FORMULA

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**ABSTRACT: OBJECTIVE:** To compare assessed EFW by clinical method (Johnson's formula) and ultrasonography with birth weight for accuracy. **AIM:** to prove reliability and accuracy of the clinical and sonographic method to assess the EFW. **INTRODUCTION:** Fetal weight is an important predictor of perinatal morbidity, mortality and maternal mortality. Accurate estimation of fetal weight is paramount importance in high risk pregnancies for the management of labor. An infant born with unsuspected growth restriction is more likely to have significant compromise. The two main methods for predicting birth weight are clinical method and ultrasonography. These methods require clinical skills and expertise to get the result with more accuracy. **MATERIALS AND METHOD:** 50 term pregnant women were selected by conventional sampling method. All term women were admitted after obtaining written and informed consent and subjected for clinical examination and ultrasonography. Those delivered within 24 hrs. following assessment were included in the study. Two senior residents were assigned to do clinical examination by Johnson's formula. The equation for Johnson's technique is as follows: fetal weight (g) = [fundal height (cm)-n]\*155(n=12 if vertex is above the level of Ischial spine or 11 if below ischial spine). Ultrasound estimation was performed by senior obstetrician trained in ultrasonography and recorded using GE200L. Hadlock formula-2 was set for estimation. Women were observed until birth. All new born were weighed using same scale after birth. The estimated weight by both methods was compared with birth weight. Accuracy determined by percentage error and proportion of estimate within +/-10% of actual birth weight. **RESULT:** For statistical analysis birth weight was categorized in to VLBW, LBW, NBW and HBW. In LBW group the mean ABW 2359g (151 SD), while mean EFW by USG and Johnson's formula reported were 2492g (246 SD) and 3109g (369 SD) respectively. In NBW group mean ABW 3074g (362 SD), while mean EFW by USG and Johnson's formula were 3044g (380 SD) and 3229(462SD) respectively. The clinical estimates were correct to within +/-10% in 28% of cases, with sonographic estimates correct in 63% cases. In 7% of cases both the methods were inaccurate. **CONCLUSION:** Overall sensitivity of both the methods was low for EFW of macrosomic fetuses. Both methods had almost similar accuracy and sensitivity for EFW of normal weight fetuses. The observations that compared to ABW, USG has overestimated low birth weight, underestimated the high birth weight. Major error may occur both in small and large birth weight group.

**KEYWORDS:** Efw, USG, JHF, Foetal Weight

**INTRODUCTION:** Fetal weight is an important predictor of perinatal morbidity, mortality and maternal mortality. Accurate estimation of fetal weight is paramount importance in high risk pregnancies for the management of labour<sup>1</sup>. In the high risk conditions like IUGR, preterm labor, breech presentation, previous LSCS, Macrosomia, fetal weight greatly influences the strategies of

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management of the labor and delivery by timely interventions. An infant born with unsuspected growth restriction is more likely to have significant compromise. The two main methods for predicting birth weight are clinical method and ultrasonography<sup>2</sup>. These methods require clinical skills and expertise to get the result with more accuracy. The clinical techniques based on palpation of fetal parts per abdomen and Johnson's formula are called tactile assessment of the fetal size. Dare et al used this technique long back and it is one of the oldest and most popular method for assessment of fetal weight in utero.

Some studies have reported that EFW by palpation is often inaccurate due to variation in amniotic fluid, maternal obesity or uterine anomalies.<sup>3</sup>

Although different methods are available, a simple, quick and reliable method is still under debate<sup>4</sup>. The present study was undertaken to determine the accuracy of birth weight estimation by USG and Johnson's formula.

**MATERIALS AND METHOD:** Prospective study conducted at Navodaya Medical College Raichur during January to march 2012. 50 term pregnant women were selected by conventional sampling method irrespective of age, parity and medical disorders. Women with Obesity, multiple pregnancies, congenital anomalies, Intra uterine death, those delivered after 24 hrs. of assessment were excluded from study. All term women were admitted after obtaining written and informed consent and subjected for clinical examination and ultrasonography. Those delivered within 24 hrs. following assessment were included in the study.

Two senior residents were assigned to do clinical examination by Johnson's formula.

Measurements were taken by using flexible tape calibrated in centimetres. Symphysio fundal height was measured in centimetres. Per vaginal examination was done to know the level of the vertex. The equation for Johnson's technique is as follows: fetal weight (g) = [fundal height (cm)-n]\*155(n=12 if vertex is above the level of Ischial spine or 11 if below Ischial spine).

Ultrasound estimation was performed by senior obstetrician trained in ultrasonography and recorded using GE200L and convex probe 3.5MH. Hadlock formula-2 was set for estimation. Women were observed until birth. All new born were weighed using same scale after birth. The estimated weight by both methods was compared with birth weight and superiority of one method over the other was determined. Accuracy determined by percentage error and proportion of estimate within 10% of actual birth weight was considered accurate.

The accuracy of the weight was assessed by calculating the percentage that was within 10% of birth weight. Birth weight was categorized in to four groups: VLBW <1500g, LBW 1501-2500g, NBW 2501-4000g, and HBW >4000g.

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Birth weight gms	No cases	Mean ABW SD	Mean JHF +/- 10% SD	Mean USG +/- 10% SD	Accuracy
<1500	01	1400	2325 +/-232.5	2000 +/-200	Overestimated
>1501-- <2500	17	2359.412 +/-235.94 151.883	3109.118 +/-310.91 369.532	2492.471 +/-249.25 246.867	USG
> 2501-- <4000	38	3074.474 +/-307.44 362.206	3229.118 +/-334.47 462.085	3044.579 +/-304.45 380.227	USG
>4000	01	4000	3875 +/-387.5	3900 +/-390	Underestimated

**Table 1: Comparison of methods used for assessing EFW with actual birth weight for accuracy**

ABW-actual birth weight, JHF- Johnson's formula, USG-ultrasonography. SD-standard deviation.

In LBW group the mean ABW 2359g (151 SD), while mean EFW by USG and Johnson's formula reported were 2492g (246 SD) and 3109g (369 SD) respectively.

In NBW group mean ABW 3074g (362 SD), while mean EFW by USG and Johnson's formula were 3044g (380 SD) and 3229(462SD) respectively.

Birth Weight(g)	No cases	JHF EFW	USG EFW	BOTH	NONE
<1500	01	-	-	-	01
1501- 2500	17	01	15	-	01
2501- 4000	38	15	21	01	01
>4000	01				01
Total	57	16	36	01	04
Percentage	100%	(28%)	(63%)	(2%)	(7%)

**Table 2: showing number of cases within +/-10% of ABW in methods used**

The clinical estimates were correct to within +/-10% in 28% of cases, with sonographic estimates correct in 63% cases. In 7% of cases both the methods were inaccurate.

For statistical analysis birth weight was categorized in to VLBW, LBW, NBW and HBW. Accuracy compared showed USG is more accurate than Johnson's formula in NBW group. In IUGR (VLBW) and HBW group number of subjects was minimal and statistical analysis was difficult.

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In IUGR babies with birth weight <1500gms both methods overestimated EFW but with less margin by USG than the Johnson's formula. In HBW (macrosomic) babies both methods have underestimated the weight but with less margin by USG. It proves that USG is more reliable than Johnson's formula in all birth weight category group.

**DISCUSSION:** Accurate estimation of fetal weight is very important in obstetrics. It cannot be measured directly, must be estimated by fetal and maternal anatomical landmarks.<sup>1</sup> The various methods have been suggested by many workers all over the world. There have been various methods of estimating fetal weight with differing results of accuracy<sup>5</sup>. The most commonly used methods are clinical method and ultrasonographic methods<sup>1</sup>. Only few studies have compared the accuracy of fetal weight by clinical and ultrasonic measurement<sup>6</sup>. Identification of IUGR babies and macrosomic babies during pregnancy by any means will lead obstetrician to decide about mode of delivery.

The clinical measurement is confounded by placental size, liquor volume and BMI of the woman. With ultrasound, fetal biometric measurements are taken; it will not be confounded by factors mentioned<sup>1</sup>. The clinical method have tendency to overestimate the fetal weight, as a positive factor it will enhance the sensitivity of the health workers, thus contributing to reduction of obstructed labor and sequelae.<sup>7</sup> The clinical method have implications for developing countries where ultrasound facilities are not available at periphery.

The measure of accuracy used in our statistical analysis was in the number of estimate within +/- 10% of actual birth weight. The main finding of this study is that estimation of EFW by Johnson's formula is as accurate as ultrasonographic method of estimation within the normal birth weight range. The accuracy of ultrasonographic estimation of fetal weight in this study was highest in the birth weight between >1501 - <4000 g in comparison with clinical method. Both methods were inaccurate in assessing fetal weight in IUGR and Macrosomic fetus. However when there is the case of IUGR, both methods overestimated birth weight but the ultrasonic method was statistically more accurate with smaller mean error.<sup>8</sup>

We found that estimate of birth weight by Johnson's formula were almost as accurate as USG but later is more superior and reliable in around normal weight babies. Some studies demonstrated that clinical estimations are similar to or more precise than ultrasound estimation<sup>9</sup> (Patterson, 1985; Chauhan et al, 1992, 2005), some reported opposite<sup>10</sup> (Chauhan et al 2006) Humphries et al. showed that accuracy of both methods were still relatively low.<sup>11</sup> Some studies showed that ultrasound estimation is best method for EFW in IUGR and Macrosomia, but our study did not conclude so.

**CONCLUSION:** In the present study, the observations that compared to ABW, ultrasound EFW has higher accuracy than clinical EFW<sup>12</sup>. It seems that EFW by ultrasound and Johnson's formula generally underestimates the weight of the macrosomic (HBW) fetuses. Overall sensitivity of both the methods was low for EFW of macrosomic fetuses. (Naumi et al 2005).<sup>13</sup>

USG has overestimated low birth weight, underestimated the high birth weight as reported by previous studies.<sup>14</sup> Major error may occur both small and large birth weight group.<sup>15</sup>

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