



## COMPARISON OF EFFICACY OF DIFFERENT TECHNIQUE FOR ESTIMATING FETAL WEIGHT DURING PREGNANCY

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### ABSTRACT

**Introduction:** Fetal Weight estimation at term is an important factor for prevention of prematurity, evaluation of fetopelvic disproportion, induction of labour, mode of delivery and detection of IUGR. Method: This is prospective study conducted on 226 women at Government Medical College, Nagpur from November 2017 to August 2018 which included singleton pregnancies after 37 weeks of gestation with cephalic presentation without any maternal or fetal complication and delivered within 48 hours of estimation of fetal weight. Fetal Weight was estimated using clinical formula (Johnsons and Dares) and ultrasonography (Hadlock) and results were compared with actual birthweight. Results: Out of 226 cases analysed statistically ultrasonography is most accurate followed by Johnsons formula and least efficacy was with Dares formula, however percentage error of Johnsons and Hadlock formula is comparable. Conclusion: Although ultrasonography is best method for estimation of fetal weight clinical method specially Johnsons formula can be effectively used in low resource setting and should be taught to all health workers.

**KEYWORDS :** fetal weight estimation, ultrasonography, clinical methods

### INTRODUCTION

Present day obstetrics has in fact rightly been able to focus on the concept of fetal medicine as distinct and significant entity in view of rapid decline in maternal mortality and morbidity with simultaneous recognition of various forms of fetal handicaps affecting the overall perinatal mortality and morbidity. Growth is a basic fundamental of life. Assessment of fetal weight in utero leads to an improved prospective management of high risk pregnancies and considerable reduction in perinatal mortality and morbidity. It has become increasingly important especially for prevention of prematurity, evaluation of fetopelvic disproportion, induction of labour before term and detection of IUGR. Thus a quick, easy and accurate method for estimating the birth weight in utero with optimum precision would be of obvious benefit to the clinical practicing modern obstetricians. Estimation of birth weight by Johnson's formula, Dare Formula based on symphysiofundal height has advantages of speed, economy and general applicability. Obstetric ultrasound has in fact revolutionized the knowledge of fetal medicine in the present day and can predict fetal weight with a great degree of precision, however there is one radiologist for one lac population in India compared to one for ten thousand in USA. In our study birth weight will be estimated using sonographic fetal growth parameters at or near term or in early labour by Hadlock's formula and clinically by Johnson's formula and Dare formula correlated after birth with actual birth weight<sup>1</sup>.

### AIMS AND OBJECTIVES:

1. To evaluate the efficacy of fetal weight estimation by different techniques.
2. To compare the results obtained by clinical methods and ultrasound method.

### METHODOLOGY

Study design: Prospective interventional study

### MATERIALS AND METHODS

The study is a prospective study to be conducted on convenience sample of 226 pregnant women selected by simple random sampling who attended the antenatal clinic or are admitted in the antenatal ward at Government Medical College and Hospital Nagpur.

The selection of women will be done by the following criteria:

1. All women after 37 weeks of gestation.
2. All women delivered within 48 hour of ultrasonography as well as measuring the fundal height and abdominal girth.

3. Gestational age was known in all these patients by their LMP and confirmed by first or early second trimester scan.
4. Women without any fetomaternal complications and with vertex presentation.

### Exclusion criteria:

1. Multiple gestation
2. Malpresentation
3. Poly/Oligohydramnios
4. IUFD
5. Fibroids or adnexal mass
6. Antepartum haemorrhage
7. Obese patients BMI 25 and above
8. Postdatism/Preterm

After history and clinical evaluation, the following measurements will be taken by single examiner so as to avoid observers bias. Symphysiofundal height was measured using a non-elastic measuring tape with the patient in the supine position with legs semi flexed and bladder empty. The highest point of the fundus was marked by left index and middle finger with a measuring tape marked in centimeters lying in contact with the skin of the abdominal wall and the distance from the upper border of the symphysis pubis to the fundus was taken. The measurements were taken to the nearest 0.5 cm with tape reverse side up for the observer not to be influenced by the values. For AG measurement, the tape was repositioned to encircle the patients' waist, at the level of umbilicus, without applying excessive pressure to tighten the tape around the abdomen. By careful pervaginal examination the station of the vertex was determined.

The birth weight was estimated by using:

**Johnson and R.W formula:** (Symphysio fundal height in cm – n) x 155 gms. n = 13 (if vertex is at or above the level of ischial spines), n=12 (if vertex is at ischial spines), n = 11 (if vertex is below the level of ischial spines)<sup>3</sup>.

**Dare Formula:** Symphysiofundal height in cm x Abdominal Girth<sup>9</sup>.

**Hadlock's formula:**  $10^{\wedge} (1.335 - (0.0034 * AC * FL) + (0.0316 * BPD) + (0.0457 * AC) + (0.1623 * FL))$ .

All formula yields estimated fetal weight in grams. The patients are followed until delivery and all patient delivered within 48 hours was taken into study. Baby was weighed within 2hrs of the delivery and weight noted by spring balance (weighing machine). Finally,

comparative analysis of fetal weight will be made. Accuracy of both the methods will be evaluated using the actual birth weight of baby after delivery.

**OBSERVATION**

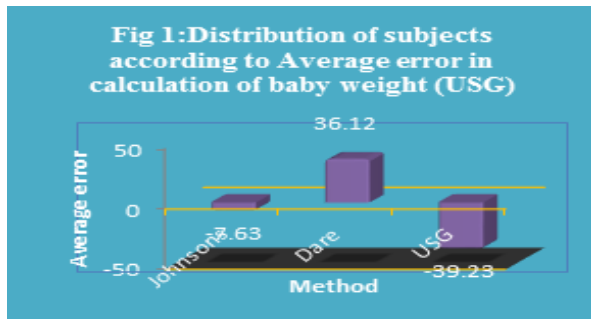
Total cases taken 226 were grouped into categories according to actual birth weight such that there were 2 (0.88%) cases <2 kg, 67 (29.65%) cases in 2-2.5 kg, 115 (50.88%) cases in 2.5-3 kg, 33 (14.60%) cases in 3-3.5 kg, 9 (3.98%) cases in >3.5 kg categories respectively. Results were put in excel sheet and mean birthweight, standard deviation of birthweight ,average error and standard deviation of error was calculated for each birth weight category. Percentage error for different method and its comparison with parity is also studied.

Overall the Mean birth weight estimated by Johnsons, Dares, USG and Actual birth Weight were 2735, 2692, 2767 and 2728gm respectively. Standard Deviation of mean birth weight 319,260,407 and 404gm respectively.

Standard Deviation of Error incurred on calculations by Johnsons, Dares, USG with respect to Actual Fetal weight were 189, 214 and 117gm respectively as per table.1 and figure 1.

**Table 1 : Distribution of subjects according to Average error in calculation of baby weight (USG)**

Method of estimation	Average error	Standard Deviation of error
Johnsons	-7.63	189.04
Dare	36.12	214.17
USG	-39.23	117.83



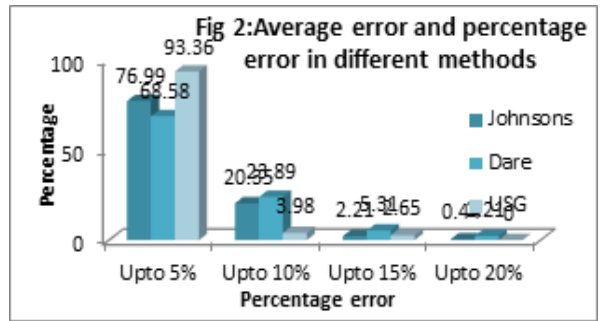
**Figure 1.**

Therefore, the Standard Deviation of Error was least with USG followed by Johnsons Formula and maximum error was with Dares formula.

Standard Deviation of Error of the Clinical Formula, Johnsons and Dares in comparison to Actual Fetal weight in various fetal weight categories suggested that maximum error by Johnsons formula was 253gm in the >3.5kg category and minimum of 157gm in the 2-2.5kg category, while by Dares Formula maximum error of 214gm in 2-2.5kg category and minimum of 72gm in >3.5 kg category. Therefore Clinical Formulae were more accurate in >3.5 kg

**Table 2 :Percentage error**

Percentage error		Johnsons	Dare	USG
Upto 5%	No.	174	155	211
	%	76.99	68.58	93.36
Upto 10%	No.	46	54	9
	%	20.35	23.89	3.98
Upto 15%	No.	5	12	6
	%	2.21	5.31	2.65
Upto 20%	No.	1	5	0
	%	0.44	2.21	0



**Figure 2.**

According to our Study in terms of Overall Percentage Error, Dares Formula has least accuracy and Hadlock has maximum accuracy. Ultrasound estimated fetal weight by Hadlocks formula are within 10% error in 92.47% cases. While clinical formulas in terms of overall percentage error are not far behind Hadlocks formula as 97.34% cases each are within 20% error .

Analysis by Parity in our Study suggests that maximum average error in fetal weight estimation by clinical method was in multigravida 98gm as compared to primigravida 67gm.

**DISCUSSION**

It is generally accepted that a simple, accurate and universally applicable method of assessing in utero fetal weight leads to improved prospective management of high-risk pregnancies and a possible reduction in perinatal mortality and morbidity. This study was conducted in labour room under Department of Obstetrics and Gynecology in Government Medical College, Nagpur. 226 pregnant women were selected who fulfilled the inclusion criteria.

In present study, mean of actual birth weight is 2728.18 ±404.32 gm. The standard deviation of prediction error indicates how much variation can be expected in the predicted birth weight by each method. Least variation was found in Dares method (±260.73 gm) followed by Johnson's (±319.06 gm) and highest variation in Hadlock's method (±407.94 gm), which is similar to the results of the study conducted by Tiwari and Sood 11.

The standard deviation of average error indicates how much variation can be expected in the predicted birth weight by each method in comparison to actual mean birth weight. Least variation was found in Hadlocks method(117gm) followed by Johnsons(189gm) and highest variation in Dares method(214gm) which is similar to results found in study conducted by Anupurna K et al24 where least variation was with Hadlock(42gm) followed by Johnsons method(121gm).

In present study, it was noted that average error in estimating fetal weight by Johnson's and Dare's formula(clinical formulas) was least in higher birth weight category, which is very similar to the results obtained by the study conducted by Bhandary Amritha et al10 (2004), Sowmya et al in 2014 and Jili Basumatary13 et al in October 2015 suggesting that Johnson's and Dare's method is more accurate in the higher weight category.

Sherman et al4 (1998) reported that rates of estimates within 10% of birth weight was not statistically significant in clinical and USG method (72% and 69%, respectively). Bhandary Amritha et al10 reported that rates of estimates within 10% of birth weights was not statistically significant in Dares method and USG method (67% and 62%, respectively). Bandhary A et al10 reported estimation by USG within 20% error was 92.5% while Dares formula was 94% and Johnsons formula 79.5%. Similar study done by Anupurna K et al24 reported estimation by USG within 20% error was 99% and 98.52% respectively for USG and Johnsons formula. Preeti A et al22 reported estimation within 20% error was 94%,94.5% and 80.5% for USG, Dares and Johnsons formula respectively. In present study fetal weight estimation by USG within 10% error was 97% of total cases

.While Johnson's formula is equally effective in predicting fetal birth weight within 10% error as compared to ultrasound. Estimation by Dares formula had 92% cases within 10% error. All three methods detected birth weight 100% within 20% error . Finally, the study suggests that Ultrasonography is the most accurate in estimating Effective Fetal weight as it considers multiple Fetal measurements in its calculations while clinical Formulae of Johnson's was comparable to ultrasonography.

## CONCLUSION

Antenatal fetal weight can be estimated with reasonable accuracy by clinical (Johnsons and Dares) and sonographic method. Clinical methods are simple, safe, easy to perform, economical. The present study indicates that, among term singleton cephalic pregnancies studied, fetal weight estimation using Johnsons formula is comparable to ultrasound estimates for predicting actual birth weight within 10%. This study also revealed that there was no significant differences found between the mean weight obtained through clinical and ultrasound assessment and actual birth weight. Also clinical method can be easily taught to Healthworkers working at low resource setting which makes it easy for them in estimating the fetal weight and taking decision regarding the mode of delivery and timely referral in case of Macrosomic and IUGR which requires expert management. Recommended based on the finding from this study is that clinical fetal weight estimation should be taught to all health workers. And it is suggested for use as a routine screening tool for all patient at term and in labour.

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**CONFLICT OF INTEREST:** None declared

**ETHICAL APPROVAL :** The study was approved by the institutional Ethics committee.

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