



REVIEW ARTICLE

COMPARATIVE STUDY OF FETAL WEIGHT ESTIMATION USING HADLOCK'S, JOHNSON'S & DARE'S FORMULA AND ITS CORRELATION WITH ACTUAL BIRTH WEIGHT

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ABSTRACT

Introduction: Accurate estimation of fetal weight is of paramount importance in the management of labor and delivery. High rate of perinatal mortality in developing countries makes estimation of fetal weight (EFW) antenatally pivotal to obstetricians.

Objective: This is a prospective study of 200 antenatal women of third trimester with a singleton pregnancy with reliable date/dating scan, with no fetal anomalies, undergoing obstetric scan at term. EFW was estimated by clinical method using Johnson's formula, Hadlock's formula & Dare's formula compared with the actual birth weight.

Results: There is significant difference between actual birth weight & Johnson's method (p value 0.001) and between actual birth weight & Hadlock's method (p value 0.001) while there is no significant difference between actual birth weight & Dare's method (p 0.464)

Conclusion: The assessment of fetal weight using Dare's formula is more accurate for predicting birth weight at term which is easy and cost-effective.

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INTRODUCTION

- One essential element which determines the outcome of the fetus is the estimation of fetal weight (EFW). Accurate estimation of fetal weight is of paramount importance in the management of labor and delivery.
- During the last decade, estimated fetal weight has been incorporated into the standard routine antepartum evaluation of high-risk pregnancies and deliveries and intra-partum evaluation and management of fetuses. High rate of perinatal mortality is still a major cause for concern in developing countries.
- Accurate EFW would help in successful management of labor and care of newborn in neonatal period and helps avoiding complications associated with fetal macrosomia or low birth weight (LBW) babies, thereby reducing perinatal morbidity and mortality.
- Macrosomia is associated with risks to the mother as well like obstructed labor, uterine rupture, cervical and vaginal lacerations, pelvic floor injuries and post-partum hemorrhage. Thus, EFW antenatally is of most important to the obstetricians so that:

- They can have preventive measures to deal with respiratory distress syndrome in a LBW neonate
- Anticipate problems of shoulder dystocia in macrosomic fetus
- They can give perinatal counseling on likelihood of survival of the neonate
- Decide on the intervention to be undertaken to postpone preterm delivery, the optimal route of delivery, or the level of hospital where delivery should occur.

Thus, reduce the risk of mortality and morbidity to mother and neonate.

MATERIALS AND METHODS

The study was conducted in Department of Obstetrics and Gynecology, B. J. Medical College and Hospital, Ahmedabad in year 2015-2016.

Study Population

- 200 antenatal women of third trimester.
- The patients were selected from outpatient department and labor wards who had their last fetal weight estimation done within 1 week of delivery.

Type of Study

Prospective study.

Inclusion Criteria

- All antenatal women of third trimester
- Vertex presentation
- Singleton pregnancy
- Patient with reliable date
- Irrespective of parity and socio economic status.

Exclusion Criteria

- Multiple gestation
- Obese women
- Presentations other than vertex
- Pregnancy with oligohydramnios or polyhydramnios
- Pregnancy with uterine or abdominal mass
- Fetal anomalies

Fetal Weight Estimation by Simplified Johnson's Formula

- Symphysio-fundal height(SFH) is measured.
- SFH-12 x 155 (if the vertex is at or above the level of ischial spines)
- SFH-11 x 155 (if the vertex is below the level of ischial spines) gives fetal weight in grams.

Fetal Weight Estimation by Hadlock's Formula using Ultrasonography (USG)

- Sonographic examination was done in all patients with measurements of Biparietal diameter (BPD), Abdominal circumference(AC) and femur length(FL) in millimeters.

BPD Measurement

The BPD was measured at right angles to the longitudinal axis of the elliptical skull at a level at which a clear midline Echo and easily discernable lateral ventricle could be Visualized. At this level, the transverse scan also should Show cavum septum pellucidum and the thalamus. BPD was measured from the outer table of anterior skull to the Inner table of the posterior skull.

Inner table of the posterior skull

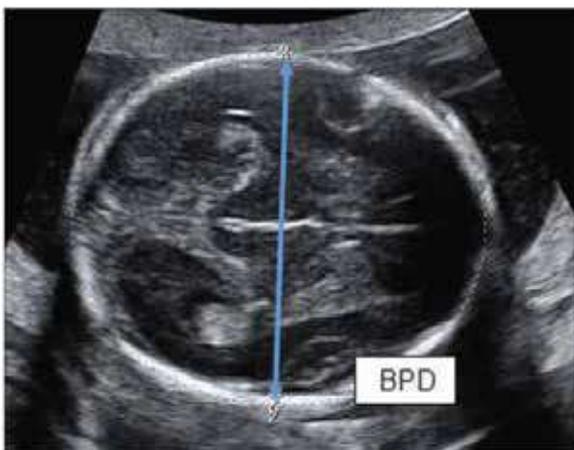


Figure 1. Measurement of biparietal diameter

AC Measurement

The measurement of the fetal AC was made from a transverse axial image of the fetal abdomen at the level of the liver. The major landmark in this section is the umbilical portion of the left portal vein deep in the liver, with the fetal stomach representing a secondary landmark.

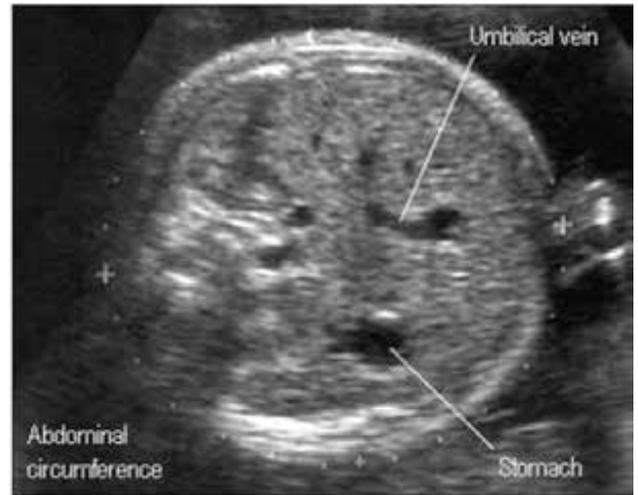


Figure 2. Measurement of abdominal circumference

FL Measurement

The shaft of the femur is the easiest fetal long bone to visualize and measure. FL measurement was obtained from the greater trochanter to the lateral condyle. The head of the femur and the distal femoral epiphysis, when present, was not included in the measurement. The measured ends of the bone were blunt and not pointed.



Figure 3. Measurement of femur length

The fetal weight was calculated using the Hadlock's formula

$$\text{Log}_{10}(\text{EFW}) = 1.4787 - 0.003343 \text{ AC} \times \text{FL} + 0.001837 \text{ BPD} + 0.0458 \text{ AC} + 0.158 \text{ FL}$$

Fetal Weight Estimation by Dare's Formula

- This is a method to calculate EFW by using symphysio-fundal height (SFH) and abdominal girth (AG) measured at the level of umbilicus.

Formula:

EBW in Grams = SFH × Abdominal girth

Fetal birth weight was calculated by these 3 methods and compared with actual birth weight which was recorded with digital baby weighing scale.

Table 1. Parity wise distribution

Parity	Number of patients	Percentage
Primipara	106	53%
Multipara	94	47%
Total	200	100%

Table 2. Mode of delivery

Mode of delivery	Number of patients	Percentage
Normal delivery	161	80.5%
LSCS	39	19.5%
Total	200	100%

Table 3. Gestational age

Gestational age(weeks)	Number of patients	Percentage
28-34	11	5.5%
35-36	116	58%
37-40	73	36.5%
>40	0	0%
Total	200	100%

Table 4. Actual birth weight

Birth weight (Kg)	Number of Babies	Percentage
<2	5	2.5%
2-2.5	61	30.5%
2.6-3	83	41.5%
3.1-3.5	46	23%
>3.5	5	2.5%
Total	200	100%

Table 5. Mean fetal birth weight

Methods	Mean fetal birth weight
Johnson's Formula	2.8632
Hadlock's Formula	2.8802
Dare's Formula	2.7872
Actual birth weight	2.7661

Table 6. Comparison between EBW by different methods & Actual birth weight

Methods	N	Mean ± Std. Deviation	p value
Actual birth weight	200	2.77±0.47	0.001
Johnson's method	200	2.87±0.38	
Actual birth weight	200	2.77±0.47	0.001
Hadlock's method	200	2.89±0.59	
Actual birth weight	200	2.77±0.47	0.464
Dare's method	200	2.79±0.39	

Table 7. Comparison between EBW by different methods

Method	N	Mean ± Std. Deviation	p value
Johnson's method	200	2.87±0.38	0.66
Hadlock's method	200	2.89±0.59	
Hadlock's method	200	2.89±0.59	0.015
Dare's method	200	2.79±0.39	
Johnson's method	200	2.87±0.38	0.0001
Dare's method	200	2.79±0.39	

- In this analysis using paired t-test, there is significant difference between actual birth weight & Johnson's method (p value 0.001) and between actual birth weight & Hadlock's method (p value 0.001)

There is no significant difference between actual method & Dare's method in comparison to rest methods (p 0.464)

- This finding is comparable with Charles Njoku et al study, 2014.

Conclusion

- This study indicates that among three methods, clinical estimation of birth weight using Dare's method shows positive correlation with actual birth weight of the fetus after delivery.
- This method clearly has a role in management of labor and delivery in a term pregnancy.
- This clinical method is simple, easy and cost-effective is of great value especially in a developing country like India.
- Recommended based on the findings 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 parturients at term and in labor.

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