



## CLINICAL VERSUS ULTRASOUND ESTIMATION OF FETAL WEIGHT AT TERM

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### ABSTRACT

Accurate estimation of fetal weight is of paramount importance in the management of labour and delivery. During the last decade, estimated fetal weight has been incorporated into the standard routine antepartum evaluation of high-risk pregnancies and deliveries. This study was to compare the accuracy of clinical and sonographic methods of predicting fetal weights at term. This prospective comparative study of 100 patients was conducted at Mahatma Gandhi Medical College and Hospital. The study participants were mothers with singleton term pregnancy admitted for delivery. The estimated mean fetal birth weight by ultrasound was 2.68kg (SD 0.50), by clinical method was 2.61kg (SD 0.49) and actual mean birth weight was 2.65kg (SD 0.52). However, there was no significant difference ( $p > 0.05$ ) between the estimates of ultrasound and clinical method and the actual birth weight. The accuracy of fetal weight estimation using Johnson's formula is comparable to ultrasound estimates for predicting birth weight at term.

**KEYWORDS :** Johnson's formula, Hadlock's formula, gestational age, fetal weight.

### INTRODUCTION

Assessment of fetal weight is a vital and universal part of antenatal care, not only in the management of labor and delivery but often during the management of high risk pregnancies and growth monitoring.<sup>[1]</sup> Birth weight of an infant is the single most important determinant of new born survival.<sup>[1,2]</sup> Both low and excessive fetal weights at delivery are associated with an increased risk of new born complications during labor and puerperium. The high perinatal morbidity and mortality associated with low birth weight are attributable to preterm delivery, intrauterine growth restriction, or both. For excessively large fetuses, the potential complications associated with vaginal delivery include shoulder dystocia, brachial plexus injury, bone injuries, and intrapartum asphyxia, while the maternal risks include birth canal and pelvic floor injuries, increased rate of operative vaginal and caesarean deliveries, and postpartum haemorrhage.<sup>[3]</sup> For instance, management of diabetic pregnancy, vaginal birth after a previous caesarean section, and intrapartum management of fetuses presenting by the breech will be greatly influenced by estimated fetal weight. Also, when dealing with anticipated preterm delivery, perinatal counselling on likelihood of survival, the intervention undertaken to postpone preterm delivery, optimal route of delivery, or the level of hospital where delivery should occur may be based wholly or in part on the estimation of expected birth weight. Limiting the potential complications associated with the birth of both small and excessively large fetuses requires that accurate estimation of fetal weight occurs before decision to deliver is made.<sup>[4]</sup> The two main methods for predicting birth weight in current obstetrics are clinical and ultrasonographic methods.<sup>[5,6]</sup> Increasing attention is being paid to the accuracy of using various ultrasound measurements in estimating fetal weight. Multiple fetal parameters for prediction of fetal weight are employed. These are the biparietal diameter, head circumference, abdominal circumference, and femoral length. Ultrasound estimation of fetal weight, while being accurate to a degree, is associated with error ranging from 6 to 11% depending on parameters measured and the equation used for estimation.<sup>[7]</sup> Although some investigators consider sonographic estimates to be superior to clinical estimates, others in comparing both techniques concurrently concluded that they confer similar level of accuracy.<sup>[8,9]</sup> In developing countries, it is important to note that ultrasound fetal weight estimation requires expensive equipment and trained personnel and is time-consuming, while clinical methods can be carried out at no cost and are easy to perform especially for less experienced examiners.<sup>[10]</sup> The aim of this study is to determine which method of fetal weight estimation (clinical or sonographic) is more accurate. This will help inappropriate decision making in the management of the pregnant woman.

Clinical methods for FWE using fundal height<sup>[11]</sup> and maternal abdominal girth measurements<sup>[12]</sup> are objective and easy to teach. However, these clinical methods for FWE have not been extensively studied and there are few papers evaluating the accuracy of FWE derived from abdominal measurements compared with ultrasound or maternal estimates.<sup>[13,14]</sup> The development and validation of simple,

effective and inexpensive tools for reproductive health are important worldwide and especially relevant in developing countries, where high-cost equipment and trained technicians are scarce.

The two main methods for predicting birthweight in current obstetrics are: (a) clinical techniques based on abdominal palpation of foetal parts and calculations based on fundal height (Johnson's formula) and (b) sonographic measures of skeletal fetal parts which are then inserted into regression equations to derive estimated fetal weight.<sup>[15,16]</sup> Although some investigators consider sonographic estimates to be superior to clinical estimates, others, in comparing both the techniques concurrently, conclude that they confer similar levels of accuracy.<sup>[17]</sup>

### Johnson's formula:

Fetal Weight in grams – 155 x (Fundal height in cms – K)  
 K - 11 (fetal head at plus station)  
 K - 12 (fetal head at zero station)  
 K - 13 (fetal head at minus station)

### Obstetric Ultrasonography

A modern method for assessing fetal weight involves the use of fetal measurement obtained via ultrasonography. The advantage of this technique is that it relies on linear and/or planar measurement of in-utero fetal dimensions that are definable objectively and should be reproducible. This method might provide an objective standard for identifying fetuses of abnormal size for gestational age.<sup>[18,19]</sup>

### AIMS AND OBJECTIVES OF STUDY

- To evaluate the accuracy of fetal weight estimation by clinical methods and ultrasound.
- To compare the results obtained by clinical methods and ultrasound with actual birth weight.

### MATERIALS AND METHOD

This prospective study was carried out in the department of Obstetrics and Gynaecology at Mahatma Gandhi Medical College, Jaipur Rajasthan. 100 antenatal women who were at term gestational age with singleton cephalic fetus were admitted and were included in the study. Expected fetal weight was obtained by clinical methods, ultrasound and the results were compared to that of actual birth weight.

All pregnant women admitted to the labor ward at full term ( $\geq 37$  weeks), with a live singleton fetus in cephalic presentation and intact membranes were eligible. Patients in the first stage of spontaneous labor, as well as those admitted for elective induction or caesarean section were included. The exclusion criteria were multiple gestations, non-cephalic presentations, oligohydramnios or polyhydramnios, uterine fibroids and known fetal malformations. Patients were not excluded due to maternal conditions such as hypertensive disorders, diabetes or obesity.

A detailed history will be obtained with regard to age, parity, socio-economic status, antenatal checkup. A thorough clinical examination including general physical examination, built, nutritional status, height, weight, blood pressure and pulse along with absence or presence of pallor and pedal edema. Per abdominal examination will be done to measure symphysiofundal height, abdominal girth, lie, presentation. All these patients will be subjected to routine investigations like hemoglobin percentage, blood counts, urine examination for albumin, sugar, microscopy, bleeding time, clotting time, (to rule out coagulation defect), blood grouping, random blood sugar. Ultrasound examination will be done to find out the expected fetal weight along with other parameters like presentation, placenta, AFI, BPD, BPP, etc., The interval between clinical and ultrasound estimation of foetal weight in-utero and delivery of babies will be within 24 hours. Clinical weight estimation was done after emptying bladder and centralizing the uterus. Using measuring tape, fundal height will be measured from the highest point on the uterine fundus to the midpoint of the upper border of the symphysis pubis. Fetal weight in grams is calculated using Johnson's formula. The patient will be sent for ultra-sonographic estimation. The formula for estimating foetal weight is that devised by Hadlock on the basis of biparietal diameter (BPD), abdominal circumference (AC), and femoral length (FL). Both the estimates will be documented into a chart. After delivery, newborn babies will be weighed within 30 minutes of delivery.

### OBSERVATIONS AND RESULT

This study recruited 100 participants from the labour room of Department of Obstetrics and Gynaecology, Mahatma Gandhi Medical College and Hospital Jaipur whose delivery was eminent in 24 hours and those planned for elective caesarean section. The fetal weight was assessed clinically by Johnson's formula and by ultrasound using Hadlocks formula. The baby birth weight was measured immediately after birth using a weighing scale.

Birth weights measured using these three different methods are summarised in Table 1.

**Table 1: The mean actual birth weights and mean fetal weight measured by clinical and ultrasound methods**

	N	Mean±SD	95% CI for mean	DF	t- test	P value
Actual fetal weight	100	2.65±0.52				
Ultrasound fetal weight	100	2.61±0.49	2.51 to 2.70	99	0.816	0.4163
clinical fetal weight	100	2.86±0.45	2.77 to 2.94	99	4.667	<0.0001

The mean of actual birth weight was 2.65 kg (SD 0.52). Estimated mean fetal weight according to the ultrasound was higher 2.68 kg (SD 0.45) but the difference was not statistically significant (p 0.50). Estimated mean fetal weight by Johnson's formula was 2.61 kg (SD 0.49) but the difference from the mean actual birth weight was not found to be statistically significant (p 0.41). However, there was no significant difference (p >0.05) between the estimates of ultrasound and clinical method and the actual birth weight.

### DISCUSSION AND CONCLUSION

Accurate prediction of fetal weight has been of great interest in obstetrics. As fetal weight cannot be measured directly, it must be estimated from fetal and maternal anatomical characteristics. Of the various methods, the most commonly used are the clinical and ultrasonographic methods as in this study. Both fetal macrosomia and intrauterine growth restriction increase the risk of perinatal morbidity and mortality and of long-term neurologic and developmental disorders.<sup>[20,21]</sup> Identification of intrauterine growth restriction and macrosomia will reduce the chance of fetal morbidity and mortality.<sup>[20,21]</sup>

Precise foetal weight estimation would help in successful management of labour and care of new born. This will prepare us for any complications associated with low birth weight or macrosomia. Perinatal morbidity and mortality may decrease if timely intervention is undertaken.

Clinical estimation is as accurate as routine ultrasonographic estimation in average birth weight is emphasised by other authors as well.<sup>[22]</sup> In a study involving 46 patients, Banerjee et al.<sup>[14]</sup> did not find significant differences in the mean absolute simple error and mean standardized error of FWE using Johnson's formula or ultrasound. Similarly, Cury and Garcia<sup>[13]</sup> reported that FWE using Johnson's formula was as accurate as ultrasound estimates.

The present study indicates that, among full-term singleton cephalic pregnancies, fetal weight estimation using Johnson's formula is just as accurate as ultrasound estimates for predicting the actual birth weight.

This simple clinical method for FWE is easy to perform and teach and may be useful, inexpensive and practical tools for predicting birth weight, in developing countries with resource poor set ups where ultrasound services are not readily available in the health care system. In addition, skills and experience of the clinician and standardization of the clinical method increase its accuracy.

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