

## An Attempt to Compare Clinical Methods and Sonological Estimation of Fetal Weight among Term Pregnant Women at a Tertiary Care Hospital of Bihar

Archana Bharti<sup>1</sup>, Seema Prasad<sup>2</sup>, Shashi Prabha<sup>3\*</sup>

<sup>1</sup>Assistant Professor, Department of Obstetrics and Gynecology, DMCH, Darbhanga, Laheriasri, Bihar, India

<sup>2</sup>Associate Professor, Department of Obstetrics and Gynecology, DMCH, Darbhanga, Laheriasri, Bihar, India

<sup>3</sup>Senior Resident, Department of Obstetrics and Gynecology, DMCH, Darbhanga, Laheriasri, Bihar, India

Received: 05-12-2021 / Revised: 27-12-2021 / Accepted: 12-01-2022

### Abstract

**Introduction:** Birth weight is the greatest single factor in the survival of fetus and important factor of neonatal problems. The objective of this study was to assess the fetal weight in term pregnancies by clinical methods and by ultrasound using Hadlock's formula and to assess the accuracy of these methods when compared to neonatal weight. **Material and Methods:** A prospective cross-sectional hospital based study was conducted by the Department of Obstetrics and Gynecology, Darbhanga Medical College and Hospital, Laheriasri, Darbhanga, Bihar, India. The study was conducted over duration of eighteen months between July 2020 to November 2021. 150 women were recruited for the study, but only 121 completed the study. These patients who were selected from antenatal clinics and maternity wards had their last fetal weight estimation done within one week of delivery. The study was approved by institutional ethics committee. Detailed obstetric and menstrual history was taken. The duration of gestation was calculated according to Naegle's rule or by first trimester scan report. Fetal weight was estimated by clinical methods and by ultrasound. **Results:** A total of 121 consecutive women were studied. Most of the women were between 21-30 years of age and primigravida. Post-delivery, the actual birth weight of babies was between the 1900 Grams to 4150 Grams. Mean birth weight (rounded off) was  $2850 \pm 623.8$  Grams. Maximum babies were in range of 2501 -3000 gram, followed by 3001-3500 grams. Results of the correlation analysis showed that there is a significant relationship between estimated and actual birth weights for all the methods. **Conclusion:** Based on this finding, combining the different methods of fetal weight prediction to improve their overall accuracy may be possible.

**Key Words:** Clinical Methods, Sonological Estimation, Fetal Weight, Pregnant Women

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

### Introduction

Fetal weight in conjunction with gestational age is an important indicator of pregnancy outcome[1]. Birth weight is the greatest single factor in the survival of fetus and important factor of neonatal problems[2]. Extremes of birth weight are associated with an increased risk of newborn complications during labour and puerperium[3]. Accurate estimation of fetal weight helps in decision making in preterm fetus, small for gestational age (SGA) fetus, fetal growth restriction (FGR), preterm premature rupture of membranes, large for gestational age (LGA) fetus, macrosomic fetus, previous cesarean sections where the time and the route of delivery needs to be planned in advance. Thus estimating fetal weight antenatally is important to the obstetricians to prevent respiratory morbidity and anticipate problems of shoulder dystocia to reduce the risk of mortality and morbidity to mother and neonate[4]. The main difficulty in assessing fetal weight is inaccessibility of fetus to outside world[5]. Accurate estimation of fetal weight would help in successful management of labour and care of the newborn in the neonatal period and prevent complications associated with fetal macrosomia and low-birth weight babies, thereby decreasing perinatal morbidity and mortality[6-7]. The available techniques for fetal weight estimation are clinical methods and ultrasonography (USG). Some investigators consider sonographic estimates to be superior to clinical estimates; others confer similar level of accuracy. Several studies indicate that physician conducted physical examination of pregnant women and estimated fetal weights are superior to ultrasonic fetal measurement[8-9].

All currently-available techniques for estimating fetal weight have significant degree of inaccuracy, and various studies have been done to compare the accuracy of different methods of estimation. The potential complication associated with birth of both small and excessively large fetuses requires that accurate estimation of fetal weight occurs in advance of deliveries[10].

The objective of this study was to assess the fetal weight in term pregnancies by clinical methods and by ultrasound using Hadlock's formula and to assess the accuracy of these methods when compared to neonatal weight.

### Material and Methods

A prospective cross-sectional hospital based study was conducted by the Department of Obstetrics and Gynecology, Darbhanga Medical College and Hospital, Laheriasri, Darbhanga, Bihar, India. The study was conducted over duration of eighteen months between July 2020 to November 2021. 150 women were recruited for the study, but only 121 completed the study. These patients who were selected from antenatal clinics and maternity wards had their last fetal weight estimation done within one week of delivery. The study was approved by institutional ethics committee. Detailed obstetric and menstrual history was taken. The duration of gestation was calculated according to Naegle's rule or by first trimester scan report. Patients in whom delivery was anticipated within one week were included in this study; and those who did not deliver within one week of fetal weight estimation were excluded from the study. Fetal weight was estimated by clinical methods and by ultrasound.

#### 1. Fetal weight estimation by clinical methods

EFW (Wt in Grams) = AG (cms) x SFH (cms) (Insler's Formula)  
After emptying the bladder, patient was in supine position with legs flat on the bed. Abdominal girth was measured at the level of umbilicus and expressed in centimetres. After correction of dextro-rotation, Mc Donald's measurement of height of the fundus from

\*Correspondence

**Dr. Shashi Prabha**

Senior Resident, Department of Obstetrics and Gynecology, DMCH, Darbhanga, Laheriasri, Bihar, India.

E-mail: [shashiprabha.dr.gyno@gmail.com](mailto:shashiprabha.dr.gyno@gmail.com)

upper edge of symphysis pubis following the curvature of abdomen were taken in inch initially to prevent observer bias and then expressed in centimetres. The upper hand was placed firmly against the top of the fundus, with the measuring tape pressing between the index and middle fingers; readings were taken from perpendicular intersection of the tape with the fingers.

**2. Fetal weight estimation by simplified Johnson’s formula**

McDonald’s measurement of Symphysiofundal height is done. Station of presenting part was assessed by abdominal examination and by vaginal examination. Fetal weight was estimated as follows: Fetal weights (Grams) = (McDonald’s measurement – 13) x 155. When the presenting part was at ‘minus’ station = (McDonald’s

measurement – 12) x 155, when presenting part was at ‘zero’ station. = (McDonald’s measurement – 11) x 155 when presenting part was at plus station.

**3. Estimated fetal weight on USG report**

Predicted estimated fetal weight by each method was compared with respective neonatal actual birth weight using electronic machine.

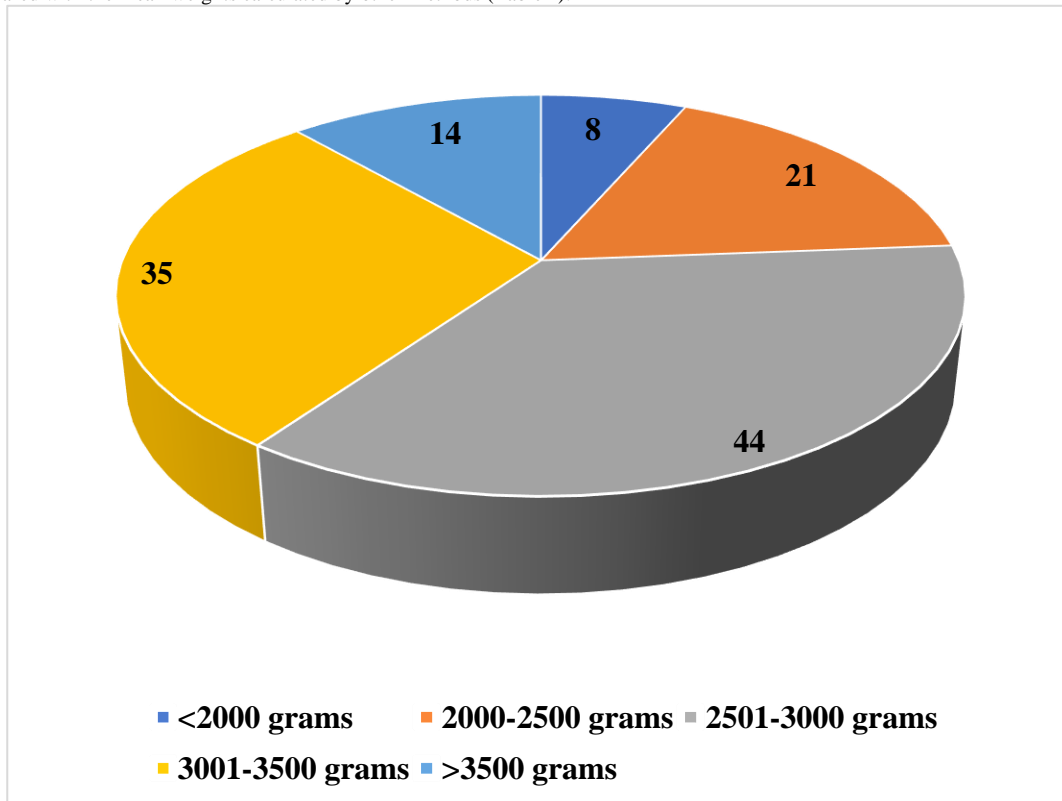
**Results**

A total of 121 consecutive women were studied. Most of the women were between 21-30 years of age and primigravida. Table 1 represents the patient profiles of the studied women.

**Table 1: Clinical profile of the study participants**

Profile of the patients	Number (%)
<b>Age</b>	
<21 years	11 (9.1%)
21-30 years	72 (59.5%)
>30 years	38 (31.4%)
<b>Gravida</b>	
Primigravida	72 (59.5%)
Multigravida	49 (40.5%)
<b>Gestational age at delivery</b>	
37-38 weeks	33 (27.3%)
38.1-39 weeks	37 (30.6%)
39.1-40 weeks	39 (32.2%)
40.1-41 weeks	9 (7.4%)
41.1-42 weeks	3 (2.5%)
<b>Mode of delivery</b>	
NVD	59 (48.8%)
LSCS	62 (51.2%)

Post-delivery, the actual birth weight of babies was between the 1900 Grams to 4150 Grams. Mean birth weight (rounded off) was 2850 ± 623.8 Grams. Maximum babies were in range of 2501 -3000 gram, followed by 3001-3500 grams (Figure 1). The mean actual birth weight of the babies was compared with the mean weights calculated by other methods (Table 2).



**Figure 1: Distribution of babies born to women included in the study population based on their actual birth weight**

**Table 2: Mean birth weight by different method and difference from actual birth weight.**

Method	Mean birth weight $\pm$ SD (grams)	Mean Difference (grams)	P value
<b>Actual birth weight</b>	2850 $\pm$ 623.8	-	-
<b>Weight by clinical method (AG * SFH)</b>	2740 $\pm$ 573.3	110	<0.05
<b>Weight by modified Johnson's formula</b>	2620 $\pm$ 821.8	230	<0.05
<b>Weight by USG</b>	3010 $\pm$ 761.9	-160	<0.05

Results of the correlation analysis showed that there is a significant relationship between estimated and actual birth weights for all the methods. This relationship was used to predict the actual birth weight by using estimated fetal weight. The standard deviation indicates how much variation can be expected in the predicted birth weight by each method. Least variation was found in AG x SFH followed by USG and highest variation in Johnson's Formula (Table 3).

**Table 3: Correlation co-efficient and standard deviation of prediction error for various methods used**

Method	Correlation coefficient	Standard deviation (grams)
<b>Clinical method (AG * SFH)</b>	+0.74	232.7
<b>Modified Johnson's formula</b>	+0.39	342.5
<b>USG</b>	+0.77	265.4

### Discussion

Accurate estimation of fetal weight is of paramount importance in the management of labour and delivery. During last decade, estimated fetal weight has been incorporated into the standard routine antepartum evaluation of high risk pregnancies and deliveries. A lot of work has been done to find out accurate methods of estimation of fetal size and weight in utero. They include clinical and ultrasound estimations. Equipped with information about the weight of fetus, the obstetrician managing labour is able to pursue sound obstetric management decreasing perinatal morbidity and mortality[9, 10]. In present study, the mean birth weight of AG $\times$ SFH Formula was closest to the mean of actual birth weight as compared USG estimation and Johnson's formula. Similar observations were reported by Chauhan et al[11]. the p value obtained for all the methods was <0.05. This indicates that formulae are significant in obtaining the mean birth weight but not when taken individually. In their study Raghuvanshi et al found average error was minimum (140 grams) with Ultrasound and maximum with Johnson's (454.9 grams)[12]. In Present study average error was also least with Ultrasound followed by AG $\times$ SFH Formula. The error was Maximum with Johnson's Formula. The mean error by USG because the Hadlock formula uses four parameters. The difference in average error between Hadlock's formula using Ultrasonography and AG x SFH is not statistically significant. Similarly, maximum error was also least with Hadlock's formula and least with Johnson's formula. Similar observations were made by Raghuvanshi et al[12]. In the present study the standard deviation of prediction error was least with AG $\times$ SFH followed by Hadlock's using Ultrasound and maximum with Johnson's formula. Chauhan et al also reported that standard deviation of prediction error was least with Hadlock's (258.8grams) followed with AG $\times$ SFH[11]. Our study had some limitations. All fetuses tend to gain some weight in utero from the day of scan till date of delivery. In our study correction for weight gain is not made. As present study was done in the teaching institution and different scans are done by different radiologists, hence there might be inter-observer errors.

### Conclusion

Clinical estimation especially by SFH $\times$ AG method is as accurate as routine USG estimated in average birth weight. Ultrasound require sophisticated instrument for carrying out the procedure. Hence it becomes costlier in a low resource set up. SFH  $\times$  AG clinical formula can be of great value in developing countries like ours, where ultrasound is not available at many health care centers especially in a rural area. Based on this finding, combining the different methods of fetal weight prediction to improve their overall accuracy may be possible.

**Conflict of Interest: Nil Source of support: Nil**

### References

- Barnhard Y, Bar-Hava I, Divon MY. Accuracy of intrapartum estimates of fetal weight. Effect of oligohydramnios. J Reprod Med. 1996;41(12):907-10.
- Raman S, Urquhart R, Yusof M. Clinical versus ultrasound estimation of fetal weight. Aust N Z J Obstet Gynaecol. 1992; 32(3):196-9.
- Jolly MC, Sebire NJ, Harris JP, Regan L, Robinson S. Risk factors for macrosomia and its clinical consequences: a study of 350,311 pregnancies. Eur J Obstet Gynecol Reprod Biol. 2003; 10:111(1):9-14.
- Nahum G. Estimation of fetal weight-a review article accessed from (<http://www.emedicine.com>) in June 2022.
- Sirohiwal D, Singal SR, Passi V, Sen J. Estimation of fetal weight. Obstet Gynaecol Today. 2004; 9:247-9.
- Mehdizadeh A, Alaghebandan R, Horsan H. Comparison of clinical versus ultrasound estimation of fetal weight. Am J Perinatol. 2000; 17(5):233-6.
- Wilcox AJ, Skjaerven R. Birth weight and perinatal mortality: the effect of gestational age. Am J Public Health. 1992; 82(3):378-82.
- Ratanasiri T, Jirapornkul S, Somboonporn W, Seejorn K, Patumnakul P. Comparison of the accuracy of ultrasonic fetal weight estimation by using the various equations. J Med Assoc Thai. 2002; 85(9):962-7.
- Baum JD, Gussman D, Wirth JC. Clinical and patient estimation of fetal weight vs. ultrasound estimation. J Reprod Med. 2002; 47(3):194-8.
- Hendrix NW, Grady CS, Chauhan SP. Clinical vs. sonographic estimate of birth weight in term parturients. A randomized clinical trial. J Reprod Med. 2020; 45(4):317-22.
- Chauhan KP, Patel UJ. Comparative study of various methods of fetal weight estimation at term pregnancy. The Journal of Integrated Health Sciences. 2021; 1(1):3-6.
- Raghuvanshi T, Pawar M. Comparative Study of Fetal Weight Estimation by Various Methods among Term Pregnancies at Rural Tertiary Care Centre, Maharashtra. Journal of Evolution of Medical and Dental Sciences. 2022; 3(41):10291-6.