

COMPARATIVE STUDY OF FOETAL WEIGHT ESTIMATION BY VARIOUS METHODS AMONG TERM PREGNANCIES AT RURAL TERTIARY CARE CENTRE, MAHARASHTRATushar Raghuvanshi¹, Milind Pawar², Amol Patil³**HOW TO CITE THIS ARTICLE:**

Tushar Raghuvanshi, Milind Pawar, Amol Patil. "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 2014; Vol. 3, Issue 41, September 04; Page: 10291-10296, DOI: 10.14260/jemds/2014/3336

ABSTRACT: BACKGROUND: Accurate estimation of foetal weight is important to obstetrician to prevent maternal and perinatal complications with timely interventions. Several methods are available for foetal weight estimation. At a low resource set up simple and cost effective technique may be useful. **OBJECTIVES:** Estimating the foetal weight among term pregnancies by clinical and ultrasonography method and to do the comparative evaluation of the estimated weight with actual birth after delivery. **METHODOLOGY:** Prospective comparative study was carried out for the period of two years among term pregnant women admitted for planned delivery. The foetal weight was estimated in term pregnancies by various methods. Actual weight of the baby is taken after delivery. Data analyzed using SPSS Software. **RESULTS:** The mean of Actual birth weight (2593gm), mean estimated foetal weight by SFH X AG (2696gms), Hadlock's (2574gms) and Johnson's (2893gms). The average percentage error was 6%, 12% and 17.5% by Hadlock's, SFH X AG, and Johnson's methods respectively. Underestimation of fetal weight is 20% among normal weight babies by Hadlock's method while 32% and 68% overweight fetal weight estimation by SFH X AG & Johnson's method respectively. Conclusion: Clinical estimation especially by SFH X AG method is as accurate as routine USG estimated in average birth weight. SFH X 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.

KEYWORDS: Comparison, Foetal weight, Clinical, Ultrasound, Methods.

INTRODUCTION: Accurate estimation of foetal weight can help the obstetrician in knowing the salvagibility of the baby outside the uterus, as birth weight is the principle variable affecting the survival of the neonate. Both low birth weight and excessive foetal weight at deliveries are associated with an increased maternal and neonatal complication during labour and puerperium.¹ Knowledge of the weight of the foetus in utero is important for the obstetrician to decide the mode of delivery so that maternal and perinatal complications can be anticipated and prevented with timely intervention.² For instance, management of diabetes pregnancy, vaginal birth after previous caesarean section and intrapartum management of foetus presenting by breech will be greatly influenced by estimated foetal weight.³

Clinical methods are simple and require no sophisticated instruments, but it has been criticized as less accurate observer variation. The ultrasound a method have an advantage of being accurate, simple and non-invasive and has gained much popularity.¹ However set up in a low resource setting sophisticated techniques may not be available or may be costlier. Several studies have found clinical methods quite reliable^{1, 3, 4}.

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Hence the present study has been carried out with the objective of estimating the foetal weight among term pregnancies by clinical and ultrasound method and to do the comparative evaluation of the estimated weight with actual birth after delivery.

MATERIAL AND METHODS: The present prospective comparative study was carried out in the department of Obstetrics and Gynaecology, Medical college and hospital in a rural area of Maharashtra, for the period of two years i.e. "Between" January 2004 to December 2006.

Pregnant women admitted for planned delivery at term for various reasons included for the study purpose. Inclusion criteria includes having singleton pregnancy, not suffering from major medical and surgical illness, no any congenital anomalies detected to the foetus, no history of any obstetric complication or high risk pregnancy. Those who having Multiple gestation, Mal presentation, Poly hydramnios or Oligo hydramnios, Fibroid of Adnexal masses, Any congenital anomalies were excluded from the study. Institutional Ethical Committee approval was taken prior to conducting the study.

The foetal weight in grams was estimated in term pregnancies by using the following three methods:

- 1) **Symphysiofundal Height (SFH) X Abdominal Girth (AG):-** Abdominal girth was measured at the umbilicus. Symphysiofundal height or McDonald's measurement was taken after correcting the dextro-rotation from the upper of the symphysis to the height of the fundus. Foetal weight in grams is calculated by Symphysio-fundal Height i.e. SFH (cm) multiplied by Abdominal Girth i.e. AG (cm).
- 2) **Johnson's formula:** (Mc Donald's measurement of symphysiofundal height in cm-X) x 155. McDonald's measurement was takes as mentioned above. Where X=13 When presentation part was not engaged=12 When presentation part was at 0 station. X=11 When presentation part was at +1 station. Weight is calculated in grams.
- 3) **Hadlock's formula using ultrasound techniques:** foetal weight is estimated with the help of head circumference (HC), abdominal circumference (AC) and femur length (FL).

The estimations were done within 24 hrs deliveries to increase prediction power of each method. Actual weight of the baby is taken after delivery.

All data collected, entered into Microsoft Excel and analyzed using SPSS Software. A comparative analysis of foetal weight estimated with the three methods with actual birth weight was done.

RESULTS: A total of 200 full term pregnant women attended obstetric department for the purpose of delivery. Out of these 62.5% cases were not registered during ANC period at the institute. Age wise 16(8%) was less than 20 years while 115 (57.5%) & 69 (34.5%) were between 20 & 25yrs and more than 25 yrs respectively. Mean gestational age was 38.48 wks (SD=1.49) & 37.89 wks (SD=1.34) as per last menstrual period & sonography respectively. 88% was delivered normally while 12% through Caesarean section. 73 (36.5%) babies were low birth weight i.e. <2500gms.

Table 1 shows comparison of estimated foetal weight by various methods with the actual birth weight. Mean Actual birth weight with SD was 2593gm + 427 while estimated foetal weight by

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SFH X AG (2696+394.2gms), Hadlock's (2574+357.1gms) and Johnson's (2893+503.2gms) methods. The average error of estimated foetal weight was 311.3gms, 454.9gms & 131gms by SFH X AG, Johnson's and Hadlock's methods respectively. Maximum error observed by Johnson's formula. The average percentage error is 6%, 12% and 17.5% by SFH X AG, Johnson's and Hadlock's methods respectively. 151(76%) followed by 130(65%) of estimated foetal weight was within 10 percent of error.

Table 2 shows comparison of various methods with each other for estimated birth weight all these comparisons were statistically significant. Mean estimated weight with SD by Hadlock's formula (2574+357.1gms) and SFH X AG (2696+394.2gms).

Table 3 shows overestimation, underestimation of foetal weight by various methods among low birth weight and normal weight babies.

Underestimation of foetal weight is more (88%) among normal weight babies by Hadlock's method. Among low birth weight babies, 82% and 90% overweight foetal weight estimation by SFH X AG & Johnson's method respectively.

DISCUSSION: Accurate prediction of foetal weight in relation to gestation age, if applied to all pregnancy assists in identifying wrong dates, intrauterine growth restriction. Equipped with information about the weight of foetus, the obstetrician is able to pursue sound obstetric and perinatal management, thereby decreasing perinatal morbidity and mortality². The present study was carried out in a tertiary care center located at a rural area. Total of 200 full term pregnancies coming for delivery during study period were included.

In the present study the mean of estimated foetal weight by SFH X AG and Hadlock's method is almost closer to the mean of actual birth weight. This shows that foetal weight estimation by clinical method of SFH X AG (2696+394.2gms) is almost closer to the actual birth weight (2593+427gms). Dare FO et al studied that product of SFH X AG in cm fairly correlates with the birth weight of the new born in grams.⁵

The average error of estimated foetal weight was minimum with the Hadlock's method followed by SFH X AG and Johnson's method which was 131,311 and 455gms respectively. Hadlock's method observed more closer values (5-1026gms) of actual birth weight than other methods (0-1406gms & 0-1771gms). Bhandary Amrita et al studied the average error in various foetal weight group by SFH X AG was 224.3gm which was least when compared to Hadlock's method (299.1gm).² Tiwari & Sood in their study showed an average error of 346.9gms, 224.8gms, 327.2gms & 198.6gms by applying Dawns, Johnson & Warsof's ultrasound method respectively⁶. We found maximum error least by Hadlock's formula as compared to clinical methods. Bhandary Amrita et al found maximum error least by SFH X AG method.²

The average percentage error was 6% with Hadlock's method shows better accuracy than SFH X AG which has 12 % error. In the present study by simple external palpation through abdominal wall i.e. SFH X AG the estimation within 10 % error was achieved in 65% cases. Insler et al estimated foetal weight by clinical examination found that the error of estimation was within 10% in 69% cases. Examination done by persons with 3 to 30yrs of experience showed no significant difference⁷. Tiwari & Sood found 92% of cases with 15% of error by ultrasound method & 74% by clinical method.⁶ Willocks et al commented that clinical estimation of foetal weight is little more than guesswork

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because of the influence of factors like abdominal wall thickness, uterine tension, amount of liquor and position of foetus in utero.⁸

In the present study, the major finding was clinical estimation of mean foetal weight by SFH X AG (2696+ 394.2) is as accurate as the ultrasound method (2574 + 357.1). It was also statistically significant. The studies by Hendrix et al and Raman et al also showed that clinical estimation was significantly more accurate than ultrasound prediction^{7, 8}. Chauhan SP et al studied clinical and sonographic estimation of foetal weight in 1034 participants and found that sonographic estimation of foetal weight was more accurate than clinical methods.⁹

In the present study, Clinical methods viz. SFH X AG and Johnson's formula overestimated the foetal weight among the low birth weight but Hadlock's also contributed significantly (72%). Among normal weight babies, Hadlock's method by USG underestimated foetal weight (88%) more than clinical method (40%). The accuracy of foetal estimates within 10% by Hadlock's was highest in both groups. This finding is similar with Akinola S et al stated that accuracy of clinical method deteriorates markedly below 2500gm.³ Similar Titapant et al who observed that ultrasound estimation was more accurate only when there is low birth weight.¹

Ultrasound is a special form of sound which is painless, non-invasive, simple technique and has potential to screen all the patients. But this technique requires specialist as well as requirement of sophisticated instrument for carrying out the procedure. Hence it becomes costlier in a low resource set up.

However, clinical methods are Simple, convenient and costless. They do not require sophisticated instruments for estimation foetal weight. This method can be performed by the trained health care worker especially in a rural set up.

The study concludes all currently available techniques have significant degree of inaccuracy. Clinical estimation especially by SFH X AG method is as accurate as routine USG estimated in average birth weight. SFH X 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 foetal weight prediction to improve their overall accuracy may be possible. Study also recommends further studies to find out accurate method of foetal weight estimation.

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Actual Birth Weight in gms. mean + SD	Methods	Estimated Foetal weight in gms mean + SD	Average Error in gms (Min-Max)	Average Percentage of Error (Min-Max)	No of estimated birth weight within 10% of error (Percentage)	Z value (P value)
2593+427.0	SFH X AG	2696+ 394.2	311.3 (0-1406)	12.0 (0%-94%)	130 (65%)	5.69 (0.01)
	Johnson's	2893+503.2	454.9 (0-1771)	17.5 (0%-119%)	73 (37%)	20.40 (0.01)
	Hadlock's	2574+357.1	131 (5-1026)	6.0 (0-70%)	151 (76%)	5.17 (0.01)

Table 1:- Comparison of mean Actual Birth Weight (Gms) with estimated fetal weight using various methods during study period

Methods	Weight in gms (mean+ SD)	Z value	P value
SFH X AG Vs Johnson's	2696+ 394.2 Vs 2893 + 503.2	15.49	0.01
SFH X AG Vs Hadlock's	2696+ 394.2 Vs 2574 + 357.1	2.09	0.05
Johnson's Vs Hadlock's	2893 + 503.2 Vs 2574 + 357.1	16.9	0.01

Table 2:- Comparison of estimated foetal weight(Gms) using various methods among the study participants

Methods	Birth weight > 2500 gms			Birth weight <2500 gms		
	Foetal weight Over-Estimation	Foetal weight Under-Estimation	Total	Foetal weight Over-Estimation	Foetal weight Under-Estimation	Total
SFH X AG	25 (60%)	17 (40%)	42	23 (82%)	05 (18%)	28
Johnson's	56 (78%)	16 (22%)	72	50 (90%)	05 (10%)	55
Hadlock's	03 (12%)	24 (88%)	27	16 (72%)	03 (28%)	22

Table 3: Distributions of overweight, underweight foetal weight estimation by various methods among the low birth weight and normal weight babies

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Date of Submission: 12/08/2014.
Date of Peer Review: 13/08/2014.
Date of Acceptance: 25/08/2014.
Date of Publishing: 03/09/2014.