

A Comparative study of Fetal Weight Estimation by Various Methods at Term Pregnancy

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ABSTRACT

Background: Estimation of fetal weight in term pregnancies is very important in deciding when to deliver the baby and mode of delivery. Estimated Fetal weight (EFW) is now incorporated in the standard antenatal evaluation of pregnancies. There are various clinical and ultrasound methods to estimate fetal size and weight in utero.

Aim: The aim of this study was to estimate fetal weight in term pregnancies by various methods and compare it to the actual birth weight in term pregnancy.

Material and Methods: This study was a prospective study done on 50 pregnant women with term gestation between 37- 40 weeks admitted for delivery in the Department of Obstetrics and Gynaecology in Chalmeda Anand Rao Institute of Medical Sciences from January 2018 to January 2019. Ultrasonographically the fetal weight is estimated by using Hadlock's formula in which weight is estimated by using fetal measurements like Bi Parietal diameter (BPD), Femur Length (FL), Head circumference (HC), Abdominal Circumference (AC).

Results: Among the various methods used ultrasonography method has a superior edge in prediction of birth weight. Of the clinical methods Insler's formula is comparable to actual birth weight next to Ultrasound.

Conclusion: Of the various methods used to estimate fetal weight ultrasound has more accuracy. However clinical methods of estimation remain a valuable alternative where ultrasound is unavailable. The clinical methods are of significance in developing countries where health care workers can predict the baby weight and can make use of referral services to decrease the perinatal mortality and morbidity.

Keywords: Fetal birth weight, insler's formulae, johnson's formulae, dawn's formulae, hadlock's formulae

INTRODUCTION

Birth weight is a single most important factor that determines the neonatal outcome and survival. Fetal and neonatal life are affected by many genetic socioeconomic and environmental factors.^[1] An accurate pre delivery assessment and estimation of fetal weight is important in many obstetric situations to make clinical decision regarding mode of delivery. Both low birth weight and

excessive fetal weight are associated with an increased risk of new born complication during labour and puerperium.

The perinatal complications like IUGR, preterm delivery can be seen in low birth weight babies. The complications like shoulder dystocia, brachial plexus injury and intrapartum asphyxia, hypoglycemia, electrolyte imbalance, and neonatal jaundice can be seen in

excessively large fetuses and maternal complications like birth canal and pelvic floor injuries in vaginal delivery and increased rate of operative vaginal and caesarean delivery and post partum haemorrhage are also seen in large fetuses.^[1,2,3,4]

World Health Organization (WHO) has recommended that newborns with birth weight less than 2500 grams may be considered to fall in low birth weight categories carrying relatively higher risk of perinatal and neonatal morbidity and mortality.^[1]

About 80% of neonatal death and 50% of infant deaths occur among these groups and they are more prone to develop recurrent infection, malnutrition, neurodevelopmental handicaps in later life. Estimation of fetal weight plays a vital role in the management of pregnancy with Diabetes, vaginal delivery after caesarean section (VBAC), and intrapartum management of fetus with breech presentation.^[5]

Estimation of fetal weight is done by both Clinical methods and by Ultrasound. Our present study is conducted to estimate the fetal weight at term pregnancies by various methods and to compare with the actual birth weight at delivery.

MATERIAL AND METHODS

This study was a prospective observational study conducted on 50 pregnant woman with term gestation admitted for delivery in Department of Obstetrics and Gynaecology, Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar from January 2018 to January 2019.

Inclusion criteria

- Pregnant woman with Singleton pregnancy
- Gestational age of 37-40 weeks
- Cephalic presentation
- Reliable LMP.

Exclusion criteria

- Pregnant woman with multiple gestation
- Malpresentation
- Polyhydramnios and Oligohydramnios
- Fibroids or adnexal masses complicating pregnancies and Obesity
- Medical disorders complicating pregnancies.

Fetal weight is estimated by clinical methods and ultrasound and compared with actual birth weight and the results are studied.

Clinical methods for assessing fetal weight

a) Insler's formula : $EFW = AG(\text{cm}) \times SFH(\text{cm})$

b) Johnson's formula : $EFW(\text{in gms}) = (SFH(\text{cms}) - X) \times 155$

c) Dawn's formula : $EFW=L \times (T/2)^2 \times 1.44$

AG-Abdominal Girth

SFH-Symphysio Fundal Height

X =13 if presenting part is at minus station

X =12 if presenting part is at 0 station

X =11 if presenting part is at (+1) station

L = Longitudinal diameter of uterus

T = Transverse diameter of uterus measured by using pelvimeter

Double wall thickness is measured midway between symphysis pubis and umbilicus. If it is more than 3 cms the excess is deducted from transverse diameter and half the excess is deducted from longitudinal diameter.

Ultrasound method for assessing fetal weight:

The fetal weight is estimated based on fetal measurements obtained by Hadlock's formula.

Ethical Approval

This study has been approved by the Institute Ethics Committee, Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar.

STATISTICAL ANALYSIS

This study is done by using descriptive statistics shown by mean standard deviation, percentage error, with the help of microsoft excel and SPSS V.25.

RESULTS

In the study the actual mean birth weight is 2965 gms+ 2(325.21) whereas the estimated mean weight with different clinical and USG are shown in table 1.

Table 1: Mean birth weight

	Mean birth weight+/-SD
Actual birth weight	2965+/-325.21
AG x SFH	2864+/-173.13
USG	3041+/-337.08
Johnson's	2840+/-122.48
Dawn's	2476+/-251.22

The avg error and percentage error in mean birth weight is lower in Hadlock's followed by Insler's (Dare's) formula^[6], then Johnson's formula^[7] which is similar to the study conducted by Parvathavarthini K et al.^[5] and the last maximum error being with Dawn's formula.

Table 2: Average error and maximum error in various fetal weight groups

Method	Birth weight in grams							
	2001-2500; n=04		2001-2500; n=04		2001-2500; n=04		2001-2500; n=04	
	Avg error	Max error	Avg error	Max error	Avg error	Max error	Avg error	Max error
AG x SFH	522	580	187	909	288	909	843	909
USG	490	732	427	1061	290	1061	520	539
JOHNSON'S	526	696	152	807	408	823	815	823
DAWN'S	63	172	295	1211	784	1211	1193	1201

Table 3: Percentage error of fetal weight by various methods

Percentage error	AG X SFH	USG	Johnson's	Dawn's
< 5%	19 (38%)	12 (24%)	15(30%)	13 (26%)
Within 5-10%	15 (30%)	11 (22%)	14 (28%)	04(08%)
Within 10-15%	06 (12%)	13 (26%)	08 (16%)	04 (08%)
Within 15-20%	02 (04%)	04 (08%)	07 (14%)	06 (12%)
>20%	08 (16%)	10 (20%)	06 (12%)	23 (46%)

Table 4: Number of cases with over and under estimate of birth weight by various methods

Method	Over estimation	Under estimation	Total
AG x SFH	18	32	50
USG	35	15	50
Johnson's	20	30	50
Dawn's	09	41	50

Table 2 shows avg error and maximum error in grams in various fetal weight groups by various methods of fetal weight estimation which shows avg error was least with Hadlock's followed by AG x SFH Formula, Johnson's and Dawn's formula. Maximum error is most marked with Dawn's and least with Hadlock's formula. These values are higher than that reported by Bhandari in their study.^[9]

Table 3 shows using Insler's formula prediction of birth weight in 30 percent of cases is within 5-10% of actual birth weight. By Hadlock's formula prediction of birth weight in 22 percent of cases was within 5-10% as compared to 28 percent of cases by Johnson's formula and 8percent of cases by Dawn's formula which was not significantly different and is comparable to that reported by Sherman and Bandari.^[8-9]

Table 4 shows that Hadlock's formula over estimated the fetal weight where as the clinical methods have a tendency to under estimate the fetal weight.

DISCUSSION

Birth weight is a key variable affecting fetal and neonatal

morbidity particularly in preterm and small for date babies. Equipped with the information about fetal weight the obstetrician managing labour is able to pursue sound obstetric management, reducing perinatal morbidity and mortality.

Clinical estimation of fetal weight in term pregnancy in present study is as accurate as ultrasound estimation of fetal weight and actual birth weight. Symphysio fundal height is one of the important clinical parameters taken for fetal weight estimation by Insler's, Johnson's and Dawn's method.

The mean birth weight of Hadlock's formula in present study is close to Ayoola et al study with mean birth weight (10) of 3238+/-452gms. Chauhan SP et al studied clinical and sonographic estimation of fetal weight in 1034 participants and found that sonographic estimation was more accurate than clinical methods.^[11]

In present study the overall variation from actual birth weight is studied by finding the mean difference between actual birth weight and expected birth weight using formula. The mean error of the Hadlock formula is least because hadlock's formula uses four parameters and

inslers formula uses only two parameters for estimating fetal weight. The least average error was observed in Hadlock's formula and the values were close between Hadlock's and Insler's method. Comparison results showed that both Hadlock's and Insler's predictions are closer to actual birth weight of the baby, the results of which are comparable to the study of Nayak and others.^[12]

Studies including the present study reported that Hadlock's formula is superior to clinical method in estimating fetal weight within 5 percent in terms of percentage error.^[13] Tushar et al found the avg error in various fetal weight groups by Hadlock's formula was least when compared to other methods^[14] which is also seen in our study. In the present study maximum error is most marked with Dawn's and least with Hadlock's formula and these values are higher than that reported by Bhandari in their study.^[9]

In present study Insler's, Johnson's and Dawn's formula have a tendency to underestimate the fetal weight where as Hadlock's formula overestimated the fetal weight which is comparable to the Tushar et al study which reported underestimation of fetal weight is 20% among normal weight babies by Hadlock's formula while 32% and 68% overweight fetal weight estimation by Insler's and Johnson's method respectively.^[14] A few studies on the other hand showed that clinical methods has the same accuracy or even better than that of hadlock's.^[15-16] While reviewing the clinical methods Ugwa concluded that though insler's is a subjective method associated with notable predictive errors, it is still of use as a valuable tool in developing countries.^[16]

CONCLUSION

Accurate estimation of fetal weight is of paramount importance in the management of labour and delivery. Clinical methods are simple and require no sophisticated instruments but has been criticized as less accurate because of observer variation, ultrasound have an advantage of being accurate, simple and non invasive.

Of all the methods ultrasonography has a superior edge in prediction of birth weight, among the three clinical methods Insler's formula is comparable to actual birth weight next to ultrasound with minimal error. In all birth ranges Ultrasound is recommended for fetal weight estimation where facilities are available however in developing countries like India where facilities are unavailable Insler's formula can be used which is simple and can even be used by Health care workers to predict the fetal weight and clinical method should remain as an alternative where ultrasound is unavailable, by intensive training of the staff. Post training assessment and periodical monitoring are important to ensure quality assured services and effective management of deliveries.

CONFLICT OF INTEREST:

The authors declared no conflict of interest.

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