

# Accuracy of Prediction of Birth Weight by Fetal Ultrasound

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## ABSTRACT

### Background

Accurate determination of fetal weight prior to delivery can have a significant bearing on the management decision in labour, thereby markedly improving perinatal outcome.

### Objective

To determine the accuracy of prediction of birth weight by fetal ultrasound.

### Methods

This is the retrospective observational hospital based study done at Kathmandu medical college teaching hospital, Sinamangal, Kathmandu from January 2010 to February 2012. Total 150 women with full term singleton pregnancy leading to live birth were included in this study. Prenatal fetal ultrasound database was reviewed for fetal weight estimation. Delivery records were reviewed for actual birth weight. Error in estimation was calculated.

### Results

Our study showed that fetal ultrasound using Hadlock's formula has error in estimation of fetal weight by about  $290 \text{ gm} \pm 250 \text{ gm}$ . In 40% of the cases, there is an error of estimation by more than 10% compared to actual weight.

### Conclusion

Significant error was seen while estimating fetal weight by ultrasound. Depending only on the fetal ultrasound for the estimation of fetal weight can lead to unnecessary obstetrical intervention. It is thus necessary to correlate the ultrasound findings with clinical examination.

## KEY WORDS

*fetal weight, Hadlock's formula, ultrasound*

## INTRODUCTION

Estimation of accurate fetal weight is paramount in deciding the obstetrical management and the fetal outcome.<sup>1</sup> In last few decades, the estimation of fetal birth weight has advanced from estimation by physical examination to fetal ultrasound using multiple parameters. This has increased the accuracy of the fetal weight estimation significantly.<sup>2,3</sup> Multiple formulae have been developed for the estimation for birth weight using ultrasound measurement.<sup>4-10</sup> At present, fetal ultrasound is extensively used to estimate the fetal weight. In Nepal, Hadlock's formula is very commonly used. Hence, we have to see the accuracy of fetal ultrasound in estimating fetal weight in Nepalese setting.

## METHODS

It is a retrospective observational hospital based study conducted at Kathmandu Medical College Teaching

Hospital, Sinamangal, Kathmandu. One hundred and fifty women with singleton pregnancy leading to term live birth between January 2010 & February 2012 were taken. Prenatal ultrasound database and delivery records were reviewed. Exclusion criteria included multiple pregnancy, preterm birth, intrauterine growth retardation and ultrasound done more than seven days before delivery.

All ultrasound examinations were performed by experienced radiologists using standard techniques. Hadlock's formula was used to calculate fetal weight.

Following data were collected: maternal age, date of delivery, mode of delivery, date of ultrasound, gestational age at ultrasound, gestational age at delivery, estimated fetal weights and birth weight of infant.

The signed error in birth weight prediction was calculated as the difference between the predicted and actual birth

weight. The negative values indicate an underestimation of birth weight and positive values indicated overestimation of birth weight. The absolute error in birth weight prediction was calculated as the absolute value of the difference between the predicted and actual birth weight. The absolute percent error was calculated by dividing the absolute error in birth weight prediction by the actual birth weight multiplied by 100. Mean error was calculated. Level of significance was set at  $p < 0.05$ .

## RESULTS

The study included 150 patients. The gestational age was between 37 weeks and 42 weeks. The age range of patients was between 18-40 years, with a mean of 25.51 years. The range of actual birth weight was between 2.11-4.9 kg with a mean of 3.07 kg (Table 1).

**Table 1. Maternal and Infant Demographics.**

Characteristics	Mean(Range)
Maternal age(in yrs)	25.51(18-40)
Gestational age at delivery (wks)	38wks 5days(37-42)
Actual Birth weight (kg)	3.07(2.11-4.9)
Estimated Birth weight (kg)	3.2(2.40-4.04)

**Table 2. Mean Error in birth weight prediction.**

Characteristics	Mean(kg) $\pm$ SD	95 % Confidence Interval (CI) (kg)
Over-estimate	0.37 $\pm$ 0.24	0.32-0.42
Under-estimate	0.22 $\pm$ 0.23	0.16-0.28
Absolute	0.29 $\pm$ 0.25	0.25-0.33

**Table 3. Error estimation.**

Characteristics	Number(percentage)
Estimate	
1. overestimate	84(56%)
2. underestimate	55(36.67%)
3. accurate	11(7.33%)
Estimation error $\geq$ 10% of ABW	60(40%)

The mean error in the estimation of birth weight was 290gm (CI: 250-330 gm)(Table 2). In 56% of the cases, fetal ultrasound overestimated the birth weight(Table 3). In average, ultrasound overestimated by 370 gm (CI: 320-420 gm)(Table 2). Fetal ultrasound underestimated the birth weight in 36.67% of the cases(Table 3). Fetal ultrasound underestimated the birth weight by 220 gm (CI: 160-280gm)(Table 2).

Sixty(40%) out of 150 estimates were more than 10% from the actual weight.

## DISCUSSION

Birth weight is the key factor for the outcome in the utero growth of fetus. It helps to determine the mode of delivery, predict the fetal outcome hence reducing the maternal and neonatal morbidity. Many studies have been undertaken to find out the accurate methods of estimation of fetal weight. It includes clinical and ultrasound estimations. Clinical method includes models incorporating height of the uterus and girth of the abdomen measured at the level of umbilicus. Estimation of fetal weight is done ultrasonographically using abdominal circumference (AC) alone (Campbell and Wilkin), AC and biparietal diameter(BPD)(Sheppard et al) AC, BPD and femur length (Hadlock et al).<sup>4-11</sup> Determination of weight within 10% of actual birth weight is considered acceptable accuracy.<sup>2,12</sup> Our study has found that USG has an error of about 290 gm in estimating the fetal weight which is almost similar to the other study.<sup>1</sup> Most of the studies show that about 75% of the estimates are within 10% of the actual weight.<sup>3,13,14</sup> But in our study, only 60% estimates were within 10% of the actual weight which is similar to the other study.<sup>2,15</sup> Ultrasound underestimated the actual weight in 36.67% of cases and overestimate 56% of cases. Thus we can conclude that ultrasound has such a high estimation error. Depending only on the fetal ultrasound may lead to unnecessary obstetrical interventions. So we suggest that ultrasound findings need to be correlated with physical examination to estimate birth weight. We also need to keep in mind that ultrasound measurements are operator dependent. So the high percentage of error in the estimation of the fetal weight may stem from the operator dependence of the procedure.

## CONCLUSION

As seen in our study, there was a significant error in the estimation of the fetal weight. Depending on fetal ultrasound only for the estimation of fetal weight can lead to unnecessary obstetric intervention. It is thus necessary to correlate the ultrasound findings with clinical examination in estimating the fetal weight.

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