Original Research Article

Correlation of ultrasonographic estimated fetal weight with actual birth weight

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Abstract

Background: Determination of the weight of fetus by means of ultrasound is an important predictor of the labour outcome and the perinatal morbidity, mortality and also the maternal morbidity. Ultrasound estimation of fetal weight at term gives an idea to the obstetrician to decide about the mode of delivery. **Objective**: The primary objective of this study is to correlate the ultrasonographic estimated fetal weight at term with actual birth weight in patients attending the medical college hospital. **Methods:** This was a cross sectional study done in a medical college hospital in salem. Retrospective study of 250 women with singleton term pregnancies attending obstetrics department of Annapoorana Medical College and Hospitals was done. The correlation between estimated fetal weight and actual birth weight was assessed by Pearsons correlation coefficient and the accuracy of fetal weight was measured by mean absolute difference, mean standard error of means , percentage of error and proportion of estimates within 10% of actual birth weight. **Results:** There was positive correlation between the ultrasound estaimated fetal weight and the actual birth weight. About 87.6% of estimated weights fell within the interval of **(Mean ± 10%)** of actual birth weight. **Conclusion:** The ultrasound fetal weight correlated well with the actual birth weight. This is an extremely important tool to make decisions in the labour room.
Keywords: Actual birth weight, estimated fetal weight by ultrasound, accuracy, salem.

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INTRODUCTION

Before the advent of ultrasound, it was customary to estimate intrauterine fetal weight by Johnsons or Dares formula. These clinical methods though still used in many health care facilities has been largely superseded by ultrasound determination of fetal weight. Extremes of birth weight are associated with increased risk of complications in the newborn. This gives valuable input to the practicing obstetrician and enabling him to take decision regarding the mode of delivery, whether to allow a vaginal delivery or else to go for caesarean section. The scan delivery interval can dilute the importance of fetal weight estimation as it is well known that the fetus continues to gain weight of 30-35 gms/day at term. There are several technical limitations of sonography for estimating fetal weight – maternal obesity, oligohydramnios, anterior placenta. In our country the administrative armamentarium in the health department are continuously monitoring the well being of antenatal mothers and have succeeded in bringing down the maternal and perinatal morbidity and mortality. Though we are yet to reach the figures of the developed nations, we are slowly and consistently striding towards that goal. Determination of fetal weight by ultrasound is a component of antenatal care. Appropriate literary reviews were made on this topic, which were a guiding platform for our study.

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MATERIALS AND METHODS

Study site: The study was done at Annapoorana Medical College and Hospitals Salem OBG department in coordination with the radiology department.

Study design: This was a retrospective cross sectional study during the period – January 2018 to December 2020.

Study population: They included all the term singleton pregnancies who fulfilled the inclusion criteria. Informed consent was obtained. A total of 250 pregnant women were included.

Inclusion criteria

a. Only women with singleton pregnancies.
b. Term pregnancies >37 weeks
c. Cases uncomplicated by maternal and fetal diseases.
d. Delivery within 7 days after Ultrasound.

Exclusion Criteria

a. Women with complicated pregnancies like multiple pregnancy, IUGR.
b. Delivery >7 days after USG

Institutional Ethical Committee clearance was got before proceeding with the studies.

Procedure and Data collection methods:

The patients case sheets were obtained to get information about age, last menstrual period, gestational age, parity, the actual birth weight, and Ultrasound estimate of the term fetal weight.

Procedure for determination of ultrasound fetal weight

The machine used was Samsung Accuvix XG in the radiology Department. Scans were done by an experienced radiologist using a 3.5 MHz curvilinear transducer. Fetal weight was calculated using Hadlock formula which takes in to consideration BPD – Biparietal diameter, HC- Head circumference, AC – Abdominal Circumference and FL- Femoral length.

Babies of similar weights can have different head sizes, so HC alone is of little value. Femoral length is not always reliable as babies can have different lengths though same weight. All the collected parameters are fed in to computer software program. The most common equations for calculating Effective fetal weight are Shepard and Hadlock formulae. Before commencing, the procedure of scanning was explained to patient. Patient was made to lie in the supine position with the abdomen exposed. Gel was applied over the abdomen.

BPD and AC measurement: obtained at a level that showed a smooth symmetric head, a well defined midline echo, thalami, the cavum septum pellucidum and the third ventricle as a transverse image of the skull. The calipers were placed from outer margin of parietal bone to inner margin of the opposite side of the parietal bone.

Figure1:

Shows the transverse image of the fetal head suitable for BPD,OFD and HC measurements[Thalami, midline unbroken echo of the Falx cerebri and Cavum septii pellucidi seen]

AC measurement: obtained using a transverse image measured at the level where the right and left portal veins were continuous with one another, appearing like a 'J shape' and the shortest length of the umbilical segment of the left portal vein was depicted. The fetal stomach represented another landmark and the vertebrae were at the horizontal plane.

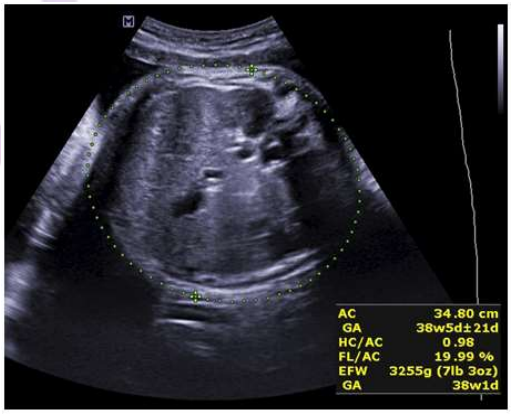


Figure2:

Shows the transverse image of the upper fetal abdomen [Fetal spine, umbilical portion of left portal vein and fetal stomach seen]

FL measurement: An iliac bone was identified and the transducer then manoeuvred until the full length of the femur was visible and as horizontal as possible. FL is the distance between outer borders of the diaphysis of the femoral bone. Care was taken to ensure that soft tissue was visible beyond both ends of the femur and that the femoral bone did not merge with the skin of the thigh at any point to enhance the accuracy of FL measurement.

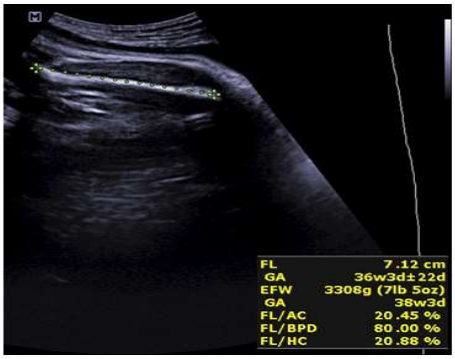


Figure3:
Shows an image of fetal femur for measuring FL

Sonographic estimated fetal weight – (EFWs)

After fetal parameters had been measured, the ultrasound scanner automatically calculated the mean and the scanner automatically measured fetal weights.

Measurement of actual birth Weights (ABW)

After cleaning the baby, the birth weight was determined using a digital baby scale.

Data analysis: Data entered into MS excel sheet.
Both descriptive statistics like mean,. Standard deviation and inferential statistics like paired t test and pearsons product moment correlation (r) were used to interpret the results. Test for significance of results was set at $P \leq 0.05$. Analysis done with SPSS software, version 24.

RESULTS

A total of 250 pregnant women participated in this study. The mean maternal age was 24.72 years (Range 18 to 37 years). The mean estimated fetal weight
by ultrasound was 2.93601 Kg while the mean birth weight was 2.89334 Kg.

Table 1: AGE DISTRIBUTION

	Frequency	Percent	Valid Percent	Cumulative Percent
Upto 20 years	31	12.4	12.4	12.4
21-25	109	43.6	43.6	56.0
26-30	91	36.4	36.4	92.4
31-35	18	7.2	7.2	99.6
36+	1	.4	.4	100.0
Total	**250**	**100.0**	**100.0**	

Table1 shows the age distribution amongst the 250 patients studied.31 subjects fell within the 'up to 20 years' group [12.4%]. Between the 21-25 we had 109 subjects[43.6%][majority of cases in this age group],between 26-30years,91 subjects[36.4%].Between 31-35..18 subjects[7.2%].Only 1 subject more than 35 years .

Table 2: GRAVIDA DISTRIBUTION

	Frequency	Percent	Valid Percent	Cumulative Percent
Primi Gravida	84	33.6	33.6	33.6
Second Gravida	85	34.0	34.0	67.6
Multi Gravida	81	32.4	32.4	100.0
Total	**250**	**100.0**	**100.0**	

Of the 250 patients studied, table 2 shows 84 subjects (33.6%) were primis, 85 (34%) were second gravid, 81 (32.4%) were multi gravida.

Table 3: BIRTH WEIGHT DISTRIBUTION

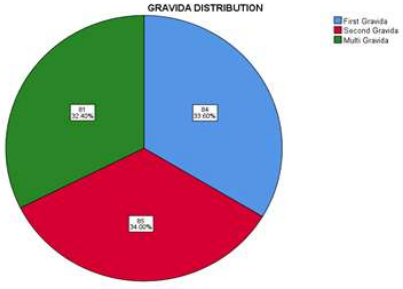
	Frequency	Percent	Valid Percent	Cumulative Percent
2000 -2499 Grams	41	16.4	16.4	16.4
2500-2999 Grams	111	44.4	44.4	60.8
3000 Grams and above	98	39.2	39.2	100.0
Total	**250**	**100.0**	**100.0**	

Table 3 shows ABW 2000 -2499 grams as 41 subjects (16.4), 2500-2499 grams as 111 subjects (44.4%), 3000 grams and above as 98 subjects (39.2%).

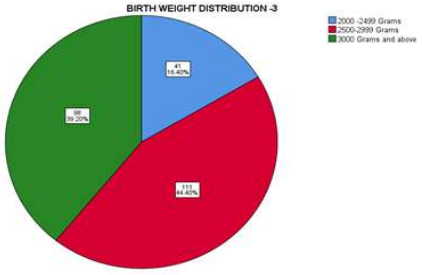
Table 4: USG WEIGHT DISTRIBUTION

	Frequency	Percent	Valid Percent	Cumulative Percent
2000 -2499 Grams	24	9.6	9.6	9.6
2500-2999 Grams	120	48.0	48.0	57.6
3000 Grams and above	106	42.4	42.4	100.0
Total	**250**	**100.0**	**100.0**	

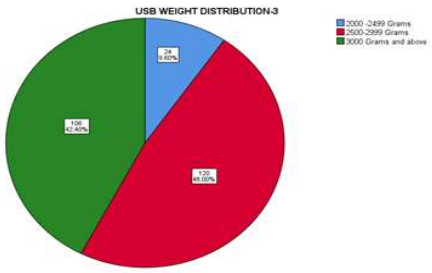
Table 4 shows 2000-2499 grams as 24 subjects (9.6%), 2500-2999 grams as 120 subjects (48%), 3000 grams and above as 106 (42.4%).



Pie chart 1



Pie chart 2



Pie chart 3

To check relationship between 2 birth weight measurements, we used Pearson Correlation Coefficient test.

Table 5: Paired Samples Correlations

	N	Correlation r	Sig. p
BIRTH WEIGHT (KG) and USG FETAL WT(KG)	250	0.746	.000

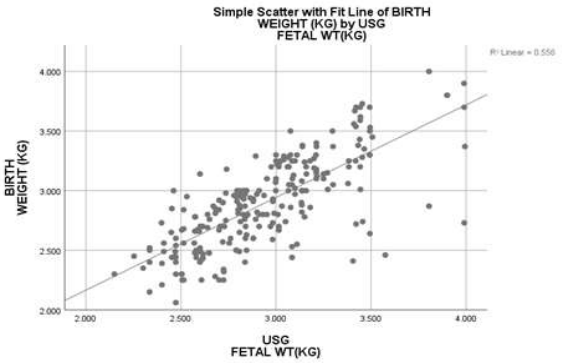


Figure 4: Scatter chart

Correlation between USG estimated fetal weight and the actual birth weight r= 0.746 , which is high +ve correlation and significant at P value 0.0001

USG FW and ABW Analysis

Table 6: Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
BIRTH WEIGHT (KG)	2.89334	250	.373422	.023617
USG FETAL WT(KG)	2.93601	250	.358261	.022658

The paired T test was applied to compare the actual birth weight and estimated USG fetal weight. The mean difference is significant at 99% confidence level at P=0.01. The absolute mean difference rated as 1.476% to the Actual Birth weight.

Mean difference = 0.042672 kg, Standard error = 0.016527 kg, T value = 2.582, P value = 0.01 Weight agreement level Birth weight ±10% is considered as an acceptable interval in which USG weight may fall. 31 USG weight fell outside this interval. 219 fell within the interval. This amounts to 87.6% acceptance.

DISCUSSION

The extent of antepartum and intrapartum care denotes the robustness of the health delivery systems. Prediction of the fetal weight is of crucial importance in planning mode of delivery. We have travelled a long way from the time of Ian Donald and reached a stage where the prediction of fetal weight ,amount of liquor etc has been mastered to perfection by means of ultrasound. The original model of the machine has been upgraded several times and we now have machines with inbuilt formulae for determining the fetal weight with precision. Especially when we are contemplating VBAC, assisted breech delivery, this weight determination becomes very important. In our study, it has been found that the actual birth weight fell within ±10%of USG predicted weight in 87.6%. Study done at a tertiary care hospital in Bharatpur, Nepal by Dr.Pratik poudel have quoted that the percentage of estimates within a +10% of actual birth weight was found to be 65% .Similar studies done by Bajracharya *et al.* ,La font *et al.*, Dimasi *et al.*,Bolanka *et al*, Colman *et al.* have quoted 60%,69%,69.6%,72.25% and 75% respectively. In our study there was a positive correlation between effective fetal weight by USG and actual birth weight. Beyond the issue of labor room dynamics, estimation of term intra uterine fetal weight helps in the categorization as per the weight and predict the perinatal morbidity and mortality.

CONCLUSION

Due to the ease of the procedure, availability of technologically improved versions of the USG, non invasiveness, ultrasound has come to be the mainstay for predicting the fetal weight. The concurrence between the term ultrasound weight and the actual birth weight at ± 10% interval was found to be 87.6% in our study. Sonography appears to be an accurate predictor of the weight of fetuses. However in certain studies it has been concluded that ultrasound offers no extra benefit and that the age old clinical methods of prediction of fetal weight are good enough. The experience of the radiologist is a very important criterion for getting accurate estimates of the fetal weight. The rationale behind choosing this study was to determine the correlation between actual birth weight and the term ultrasound fetal weight amongst the population of pregnant women attending Annapoorana medical college and hospitals who are from the nearby villages surrounding Kombadipatty so that we can extrapolate the study inference to these subjects thus helping us to make our labour room decisions.

LIMITATIONS

The sample size was taken from a population of antenatal patients attending Annapoorana medical college and hospital, so the question arises as to the extent of generalizability. Further studies need to be done to determine the most appropriate algorithm for fetal weight estimation to increase the validity of findings.

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