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Original Research Article

Correlation of estimated fetal weight by ultrasound and birth weight in low risk pregnancy: a prospective study

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ABSTRACT

Background: Sonographic fetal weight estimation is an important aspect of antenatal care. It is one of many important factors used to determine when and how to terminate pregnancy. This study was therefore carried out to sonographically estimate fetal weight with actual birth weight, to analyze various demographic parameters with birth weight and thus predict neonatal outcomes. Aim of the study was to correlate estimated fetal weight by ultrasound and actual birth weight in all low-risk antenatal women attending regular antenatal check-ups at tertiary care center
Methods: This was time bound prospective study, was conducted in pregnant women undergoing antenatal check-up in a tertiary care center from April 2022 to August 2022. During antenatal check-up, the subject was advised to undergo ultrasound imaging at 32-36 weeks and at term to look for BPD, AC, HC, FL, EFW. Clinically estimated fetal weight noted. Following delivery of baby, birthweight is recorded. Estimated fetal weight and actual birth weight are correlated and neonatal outcomes assessed.
Results: As per the study sonographically estimated fetal weight at 32-36 weeks and at term, clinically estimated fetal weight correlated positively with actual birth weight.
Conclusions: The statistics as per this study conducted in tertiary care centre in mangalore could be applied to Indian population, which may aid obstetricians in planning the mode of delivery, improve pre-labour counselling and efficient management of antenatal mother and large babies. Clinically estimated fetal weight could be used as a diagnostic tool sufficient to manage labour and delivery efficiently in low resource setting.

Keywords: Estimated fetal weight, Term scan, Actual birth weight, Antenatal care, Neonatal outcomes

INTRODUCTION

Sonographic fetal weight estimation is an important aspect of antenatal care. It is one of many important factors used to determine when and how to terminate pregnancy. Fetal weight is one of the determinants of outcome of pregnancy and also major determinant of infant mortality.[1]

The ways to estimate fetal weight include clinical and ultrasound estimation.[2] The former is composed of fundal height, size of fetal head and body, and amniotic fluid volume. The measurement of uterine size in transverse and vertical plane are also used to estimate fetal weight.[3] The measurements of biparietal diameter (BPD), abdominal circumference (AC), femur length (FL) and head circumference (HC) by ultrasonography combined with the formula of Shepard or Hadloc are also used to estimate fetal weight.[4,5] This modality of fetal weight assessment was found superior to various clinical methods, as sonological estimated fetal weight assessment relies on linear and/or planar measurement of fetal parameters,

thereby eliminating subjectivity associated with clinical methods.[6]

Sonographic fetal weight could be predicted by measuring one fetal parameter such as the BPD, AC, FL, and HC or by a combination of several of these fetal parameters. Several investigators believe, however, that a combination of several fetal parameters yields more accurate estimates of fetal weights.[7]

Prenatal fetal weight prediction is helpful in determining SGA and LGA babies, necessary for perinatal management of such babies. It helps clinicians to anticipate perinatal complications with low birth weight - preterm delivery, IUGR and to settle for optimal delivery route.[8]

Maternal risk factors associated with delivery of excessively large fetus include perineal injuries, CPD, brachial plexus injury, bony injury, intrapartum asphyxia, postpartum hemorrhage, need for operative /cesarean delivery.[9]

This study was therefore carried out to sonographically estimate fetal weight with actual birth weight, in order to determine validity of Hadlock fetal weight estimation, to analyze various demographic parameters in with birth weight and thus predict neonatal outcomes.

METHODS

This was time bound prospective study, it was conducted in pregnant women undergoing antenatal check-up during first trimester in AJ Institute of Medical Sciences and Research Centre.

Institutional ethics committee permission was obtained and subjects were recruited for study after obtaining written and informed consent.

The pregnant women were subjected to detailed medical history and examination. During antenatal check-up, the subject was advised to undergo ultrasound imaging at 32-36 weeks and at term using Affiniti 30 Philip's USG machine with 2-6MHz curvilinear probe to look for BPD, AC, HC, FL, EFW. Clinically estimated fetal weight noted. Following delivery of baby, birthweight was recorded. Estimated fetal weight and actual birth weight were correlated and neonatal outcomes assessed.

The results were analysed accordingly. Collected data was stored in MS Excel sheet and will be further analysed.

Sampling criteria

On the basis of study conducted by author Okafor et al assuming p=72.54% with 95% confidence interval and 10% allowable errort (L)-sample size estimated for the study was 79. Assuming 10 % loss to follow-up, the final sample size estimated for the study was 87.

Calculated by the formula,

$$n=\frac{Z^2\,(1-\frac{\alpha}{2})\,P\,(1-p)}{L^2}.$$

Sampling technique

The sampling technique used in the study was purposive sampling.

Baseline data was represented as percentage, quantitative data was expressed as mean and standard deviation. Karl Pearson correlation quotient was used to measure the strength of association between estimated weight and actual birth weight.

Chi square test was used to test the association of various parameters of interest, such as parity, age, BMI, mode of the delivery, maturity of fetus, clinically estimated fetal weight estimated fetal weight at 32-36 weeks scan, EFW according to term scan with actual birthweight of fetus. Neonatal outcomes such NICU admission were analysed.

Inclusion criteria

Inclusion criteria for given study were all low risk pregnant women attending regular antenatal check ups at AJIMS OPD between 18 to 40 years of age delivered at AJIMS.

Exclusion criteria

Exclusion criteria for given study were age less than 18 years or more than 40 years, preterm, high risk pregnancy, stillbirth, congenital fetal malformation, pregnancy with incomplete data and non-availability of ultrasound scan at 32-36 weeks, term gestation.

RESULTS

The data of 87 study samples were collected. The results were analyzed according to the following parameters.

Sociodemographic details of the mother

The age of the mothers ranged between 28.3±4 years (Table 1). The youngest patient in the study was 21 years. The proportion of the religions of the mothers surveyed almost corresponds to the distribution within the population.

Among the mothers had their regular antenatal check-ups at our hospital 62.1% (54) of the mothers in the study were multigravida, whereas only 37.9% (33) were primigravida, of which 46% (40) underwent normal delivery, rest of them underwent elective and emergency LSCS 20.9% (18), 33.3% (29) respectively. (Table 1 and 2).

Term deliveries were observed in 93.1% (81), 6.9 (6%) post-dated. NICU admissions of new-borns were noted to be 9.2% (8) (Table 3).

Ultrasound parameters

As per scan done at 32-36 weeks mean estimated fetal weight was 2.48±0.46 kg, clinical fetal weight ranged from 1760 g to 4551 g, EFW as per term scan was 2.92±0.43 kg, mean birth weight was 2.7±0.5 kg (Table 4 and 5).

Mean BMI of the mother was 24.92±5.51. Mean difference between birth weight and EFW at 32-36 weeks scan: 0.2±0.5, whereas mean difference between birth weight and EFW as per term scan is 0.2±0.4. Mean difference between birth weight and clinically estimated was 0.54±0.54.

Table 1: Sociodemographic details of study participants.

Variables		Frequency (n)	Percentage (%)
Age in years (mean±SD)	24.3±4.4		
Parity	Primigravida	33	37.9
	Multigravida	54	62.1

Table 2: Frequency of mode of delivery of study participants.

Delivery type		Frequency (n)	Percentage (%)
Mode of delivery	Normal delivery	40	46
	Elective LSCS	18	20.7
	Emergency LSCS	29	33.3

Table 3: Outcomes of delivery (maturity of fetus and NICU admission).

Outcomes		Frequency (n)	Percentage (%)
Maturity of foetus	Term	81	93.1
	Post dated	6	6.9
NICU admission	Not admitted to NICU	79	90.8
	Admitted to NICU	8	9.2

Table 4: Numerical representation EFW as per scan at 32-36 weeks and birth weight.

	Mean EFW (g)	Std. deviation
Scan at 32-36 weeks	2.4859	0.46525
Birth weight	2.7077	0.53632

Table 5: Data representative of mean EFW as per term scan with the birth weight.

Parameters	Mean (g)	Std. deviation
EFW as per term scan	2.9293	0.43689
Birth Weight	2.7077	0.53632

Table 6: Mean EFW as per term scan and corresponding mean clinical EFW represented in tabular columns.

Parameters	Mean (g)	Std. deviation
EFW as per term scan	2.9293	0.43689
Clinically EFW	3.2522644	0.46455176

Table 7: Correlation between EFW by ultrasound as per antenatal scan done at 32-36 weeks and at term to actual birth weight, correlation between clinically EFW to birth weight.

Correlation between	r value	P value
EFW by ultrasound as per antenatal scan done at 32-36 weeks to actual birth weight	0.49	0.001
EFW by ultrasound at term to actual birth weight	0.49	0.001
Clinically estimated fetal weight to birth weight	0.41	0.001

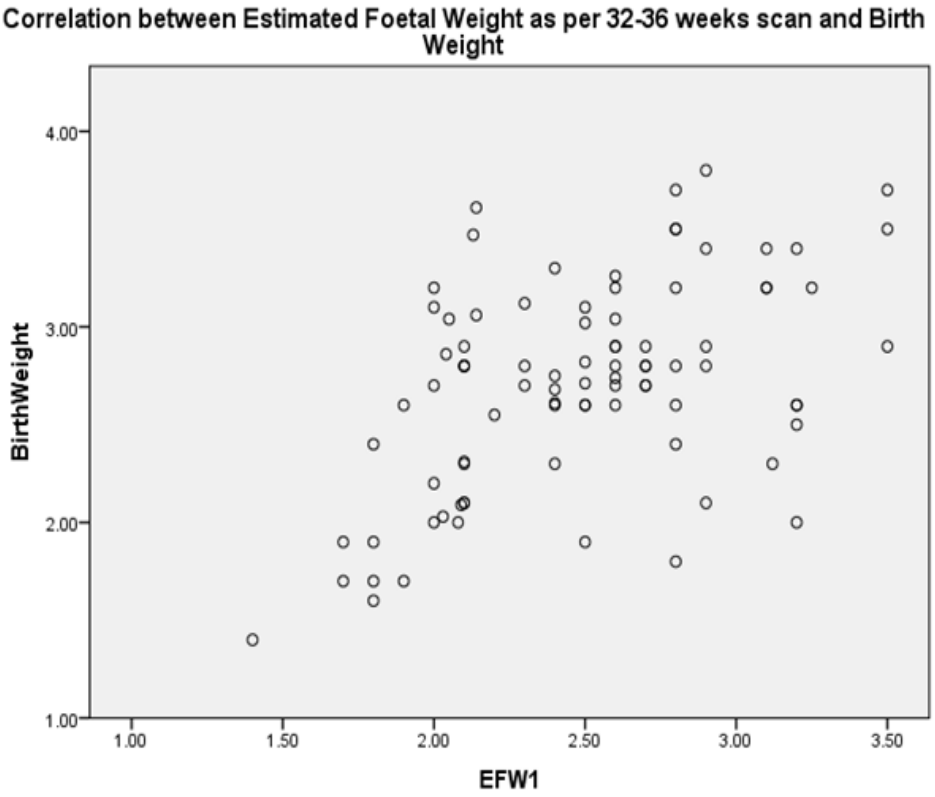

Figure 1: Correlation between EFW as per 32-36 weeks scan and birth weight.

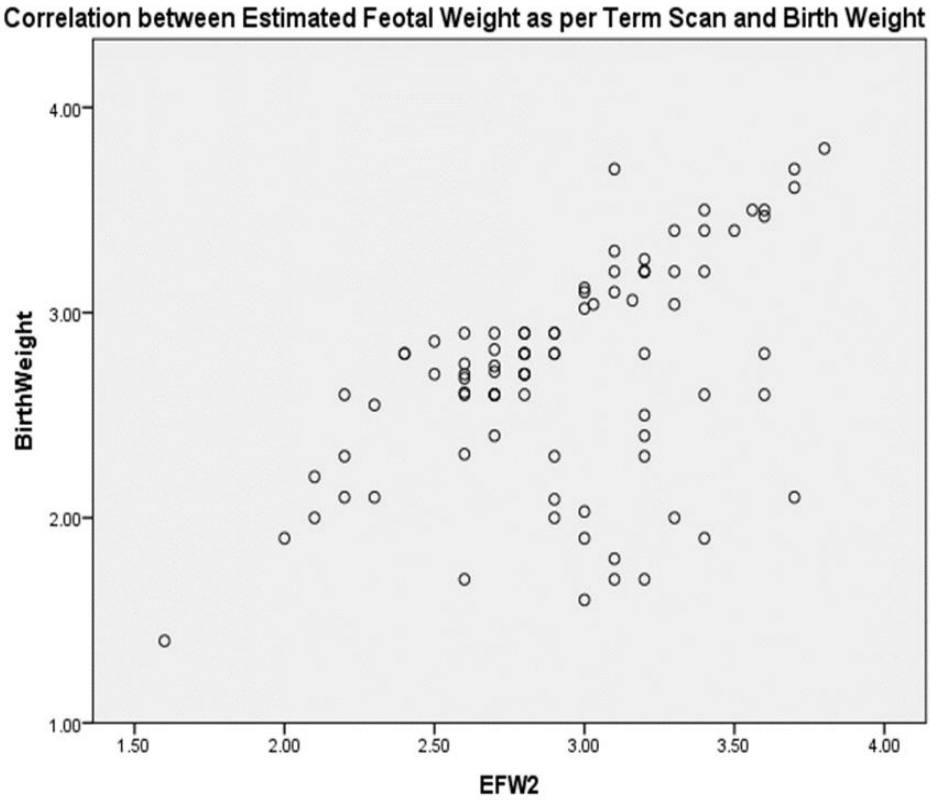

Figure 2: Correlation between EFW as per term scan and birth weight.

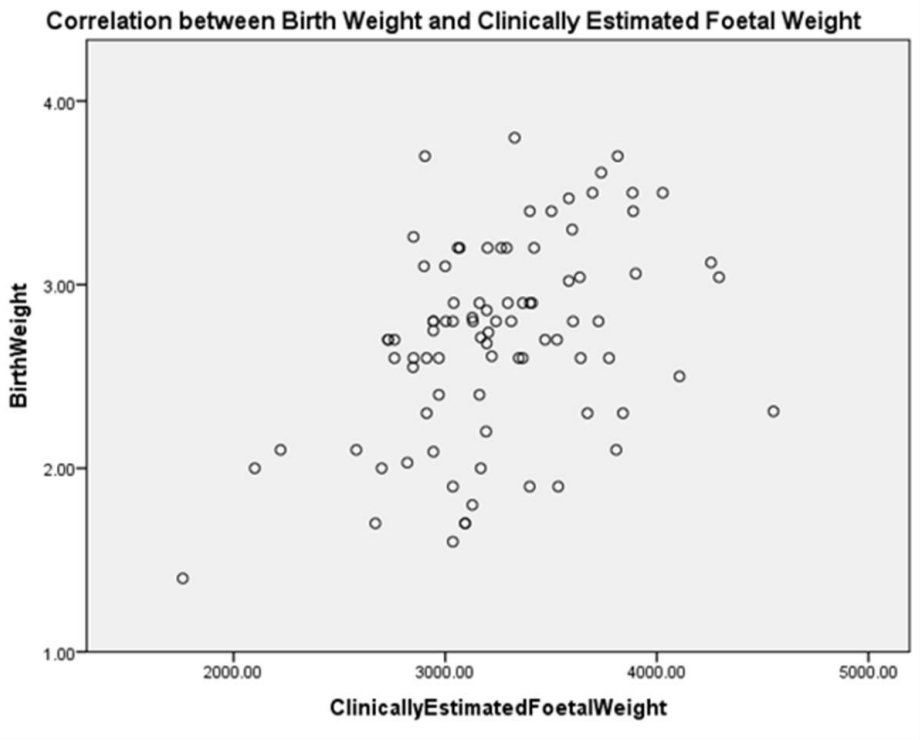

Figure 3: Correlation between birth weight and clinically EFW.

Table 7 represents that there was a positive correlation between estimated fetal weight by ultrasound as per antenatal scan done at 32-36 weeks and at term to actual birth weight, positive correlation between clinically estimated fetal weight to birth weight noted, and values were statistically significant.

DISCUSSION

The study sample consisted of participants of similar socio-demographic data in a tertiary care centre in Mangaluru. 37.9% of the subjects were primigravida, and 97% of the cases were booked with our institution. Our sample size was 87. The mean BMI value of the patients was 24.92±5.51 The mean birth weight was 2.7077 kg, mean EFW as per ultrasound at 32-36 weeks and at term and clinically estimated fetal weight was 2.4859 kg, 2.9293 kg, 3.2522644 kg respectively.

There was positive correlation between the ultrasound estimated, clinically estimated weight and the actual birth weight. Mean error was 0.2-0.5 (±0.4).

The mean percentage error was 0.45%, while the mean absolute error of estimation was 4.56%. About 86.54% of the estimated weights were within 10% of the actual birth weight. The ultrasound estimated fetal weight correlated with the actual birth weight. There was positive correlation between the ultrasound estimated, clinically estimated weight and the actual birth weight.

As per the study conducted by Okaforb et al a total of 170 pregnant women participated in the study. The mean maternal age was 30.77 years±5.54. The mean birth weight was 3.47 kg±0.47, while the mean estimated ultrasound weight was 3.43 kg±0.8. There was positive correlation between the ultrasound estimated weight and the actual birth weight. The mean ultrasound scan to delivery interval was 0.8 days (with range of 0-2 days). The study recorded a mean error of estimation of 41.17 grams and mean absolute error of 258.22 grams. The mean percentage error was 0.65%, while the mean absolute error of estimation was 7.56%. About 72.54% of the estimated weights were within 10% of the actual birth weight. The ultrasound estimated fetal weight correlated with the actual birth weight.[10]

Comparison between clinical estimated fetal weights (CEFW) versus ultrasonographic estimated fetal weight (UEFW) for co-relation with actual birth weight (ABW) in 3rd trimester of pregnancy by Razaq et al the mean age of the patients was 29.60±6.23 years and the mean gestational age of 33.30±2.31 weeks. The mean BMI value of the patients was 23.08±1.26 kg/m^2, the mean CEFW value 2219.60±556.41 grams while the mean UEFW value of the patients was 2227.77±521.94 grams and the mean value of ABW of the patients was 2284.00±515.29 grams. In the study positive correlation was found between the CEFW, UEFW with ABW of the baby concluding that both the clinical estimation ultrasonography estimation showed the feasible and reliable results. Both showed positive correlation with actual birth weight.[11]

As per our study the percentage of error was less, that was 0.2% compared to the mean percentage error was 0.65 Okaforb et al.[10] Our study not only correlated EFW as per term scan, but also correlated EFW as per 32-36 weeks scan, our study further extended towards analyzing the correlation between clinically estimated fetal weight and birth weight, giving us an upper hand in anticipating LGA AND SGA babies and thus neonatal outcomes and thus allowing a better preparedness among the clinicians for optimum obstetric care.

CONCLUSION

Sonographically estimated fetal weight at 32-36 weeks and at term, correlated positively with actual birth weight. As per study, clinically estimated fetal weight could be used as a diagnostic tool, suggesting it to be sufficient to manage labour and delivery efficiently in a low resource setting.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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