ORIGINAL ARTICLE

Comparison of Ultrasonographic Estimated Fetal Weight at Term with Actual Birth Weight in Punjab

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ABSTRACT

Background: The fetus is thought to have an inherent growth potential that under normal circumstances, yields a healthy newborn of appropriate size. Knowledge of weight of fetus in intrauterine life is important for the obstetrician to decide the management plan for delivery whether it would be vaginal or cesarean section.
Aim: To compare estimated fetal weight on ultrasound at term with actual birth weight in Bahawalnagar Punjab.
Methodology: A cross sectional analytical study was conducted at Tahir Medical Complex Haroon Abad district Bahawalnagar. Data of 200 participants were designated done suitable sample method. SPSS version 21.0 was used for data analysis.
Results: out of total number of 200 pregnant women, mean±S. D of estimated fetal weight were 3245.8150±17.53151, Mean ±S. D of actual birth weight were 3260.7700±17.80643. Mean±S.D of Biparietal diameter were 9.2325±0.23428. The minimum and maximum values were 8.70 and 9.76 respectively. Two hundred pregnant females were included in this study.
Conclusion: This study indicates that estimation of Birth weight clearly has a role in management of labor and delivery in a term pregnancy. Among term singleton cephalic pregnancies studied, fetal weight estimation using Hadlock's formula is comparable to ultrasound estimates for predicting the actual birth weight within 10%. This study also revealed the mean estimated weight through ultrasound were similar to actual weight. Our results indicated the diagnostic accuracy of ultrasound in estimation of birth weight to be considerably significant therefore it is a reliable modality for estimating fetal weight using the Biparietal diameter, femur length and abdominal circumference as compared to actual birth weight.
Keywords: Expected Fetal weight, actual fetal weight, Biparietal diameter, abdominal circumferences, femur length.

INTRODUCTION

Antenatal care reduces both maternal and infant morbidity and mortality. Prenatal fetal weight estimation is known to be an important component of standard antenatal care[1]. The estimation of fetal weight is a technique used by caregivers of pregnant women to try to determine if the baby is too large too small, or appropriate for gestational age[2]. In utero estimation of fetal weight is an important component of management of pregnancy. It provides valuable information which aids the physician/midwife to take informed decisions concerning the timing and route of delivery.[3] Fetal weight is one of the important indicators of delivery outcome and birth weight is a reliable and sensitive indicator for predicting the immediate or later outcome of a newborn. Therefore, there is no doubt about the necessity and importance of estimation of fetal weight in utero in certain situation[4]. Assessment of fetal weight is a vital and universal part of antenatal care, not only in the management of labor and delivery but often during the management of high-risk pregnancies and growth monitoring[5].

Ultrasonography in the prediction of pre-natal fetal weight is superior than the various clinical methods are used for estimation of fetal birth weight[6]. The advantage of Sonographically estimated fetal weight over clinical methods was suggested to be due to the fact that sonographic fetal weight estimation relies on objective intra-uterine linear and /or planar measurement of fetal parameters, thereby eliminating subjectivity associated with clinical methods[7]. Sonographic fetal weight prediction have also suggested the anteriorly located placenta and oligohydramnios and racial factors[8].

Ultrasonography is routinely used to estimate fetal weight and is often used as a proxy to predict actual birth weight. Accuracy of ultrasound in predicting actual birth weight is more precise than any other technique[9]. There are some limiting factors in the prediction of actual birth weight as ultrasound is operator dependent and at term there is significant deterioration of ultra sound resolution as the fluid to fetus ratio decreases, bony structures become more calcified as the vertex descends in the pelvis, making measurement of head circumference and Biparietal diameter more difficult[10].

The use of diagnostic ultrasound begins already at 4–5 weeks of gestation when it is possible to visualize the gestational sac in the uterine cavity. From approximately 5–6 weeks of gestation the embryo is visible[11]. As the pregnancy develops, the number of assessed parameters and the level of difficulty of the ultrasound procedure increase. The information acquired using this method concerning the developing embryo allow for the prediction, diagnosis and therapy of certain fetal pathologies. According to the latest reports, ultrasound scans performed during pregnancy are safe and do not affect fetal weight, premature labor risk, the child's condition at birth or perinatal mortality[12]. The primary aim of ultrasound scanning in pregnancy is to limit the risk of obstetric complications by early detection of abnormalities. These include fetal growth abnormalities such as both intrauterine growth restriction (IUGR) and macrosomia, which are more common in pregnancies complicated by diabetes, obesity, hypertension, nicotine addiction or fetal genetic defects, among other conditions[13]. Increasing attention is being paid to the accuracy of using various ultrasound measurements in estimating fetal weight. Multiple fetal parameters for prediction of fetal weight are employed[14]. Some investigators consider sonographic estimates to be superior to clinical estimates, others in comparing both techniques concurrently concluded that they confer similar level of accuracy. This study aimed in finding the most appropriate formula for birth weight estimation among the management of the pregnant women. The primary goal of this study was to then evaluate the various methods of estimating fetal weight at term and to determine their accuracy in contrast to the actual birth weight.

MATERIAL AND METHODS

A cross sectional analytical study was conducted in the Department of Radiology, University of Lahore after approval of Ethical Review Board at university of Lahore faculty of Allied Health sciences, Lahore. On the basis of diagnosis inclusion criteria were included pregnant females having the pregnancy at term with singleton pregnancy and who are willing to participate. In exclusion Criteria excluded the patient's diabetes mellitus, hypertension, pregnant ladies with past history of birth to congenital anomalies and known fetal anomalies. Data were collected with help of convenient sampling technique Data was collected according to the variable of the age, Last menstrual

period (LMP), Duration of Pregnancy by USG, Biparietal diameter (BPD), Femur length (FL), Estimated fetal weight (EWF), Actual birth weight. Total sample size was 200. After collection data were managed in Microsoft excel sheet and were analyzed SPSS version 21 was used for data analysis.

Sample size: It is estimated as 400 cases using 95% (9) with an expected sensitivity of 82% (9) with a 6% margin of error, the sensitivity of 95% (9) with a 4% margin of error taking expected percentages of consideration of lung in79% (2) of patients.

Sampling technique: Convenient sampling technique

Inclusive criteria
- Pregnant females having the pregnancy at term with singleton pregnancy
- Who are willing to participate

Exclusive criteria
- Patients with diabetes mellitus and hypertension
- Pregnant ladies with a past history of birth to congenital anomalies and known fetal anomalies.

Data collection procedure: Data was collected according to the variable of the age, Last menstrual period (LMP), Duration of Pregnancy by USG, Biparietal diameter (BPD), Femur length (FL), Estimated fetal weight (EWF), Actual birth weight. Total sample size was 200.

Data Analysis: After collection data were managed in Microsoft excel sheet and were analyzed SPSS version 21 was used for data analysis.

RESULTS

Out of total number of 200 pregnant women, mean ±S. D of estimated fetal weight were 3245.8150 ± 17.53151, Mean ±S. D of actual birth weight were 3260.7700 ± 17.80643. Mean ±S. D of Biparietal diameter were 9.2325 ±0.23428. The minimum and maximum values were 8.70 and 9.76 respectively. Two hundred pregnant females were included in this study. Mean ±S. D of abdominal circumference were 33.4360 ±1.07103, gestational age in weeks were 37.6243 ±0.88751 and gestational age in days were 263.3700 ±6.21257. Two hundred pregnant females were included in this study. Mean ±S.D of Age were 27.08 ± 6.48. Two hundred pregnant females were included in this study. Mean ±S.D of estimated fetal weight were 3245.8150 ± 17.53151

Two hundred pregnant females were included in this study. Mean ±S.D of actual birth weight were 3260.7700 ± 17.80643

Mean estimated fetal weight is significantly different from mean actual birth weight as the p – value = 0.000 < α = 0.05.

Two hundred pregnant females were included in this study. Mean ±S. D of abdominal circumference were 33.4360 ±1.07103

Two hundred pregnant females were included in this study. Mean ±S. D of gestational age in days were 37.6243 ±0.88751

Two hundred pregnant females were included in this study. Mean ±S. D of gestational age in weeks were 263.3700 ±6.21257

Ultrasound done at 36 weeks and 5days with BPD measuring 9.07 cm, FL 7.18cm and AC 32.6 cm with the estimated fetal weight being 3036 g.
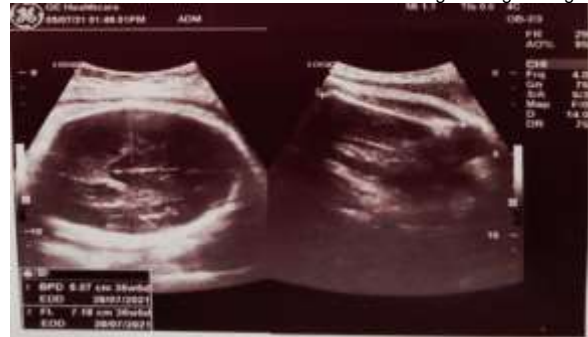
Ultrasound done at 37 weeks and 2 days with BPD measuring 9.15cm, FL 7.27cm and AC 33.47cm with the estimated fetal weight being 3210 g

Table 1: Descriptive statistics of Age: Descriptive Statistics

	N	Range	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Age	200	24.00	18.00	42.00	27.08	.46	6.48

Table: 2 Descriptive statistics of estimated fetal weight and actual birth weight: Descriptive Statistics

	N	Range	Minimum	Maximum	Mean		Std. Deviation
						Std. Error	
Estimated fetal weight	200	1109.00	2714.00	3823.00	3245.8150	17.53151	247.93296
Actual Birth weight	200	1150.00	2670.00	3820.00	3260.7700	17.80643	251.82098

Table: 3 Paired samples test is applied to compare average estimated fetal weight and actual birth weight: Paired Samples Test

Pair 1	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Estimated fetal weight - Actual Birth weight	-14.95500	31.64078	2.23734	-19.36694	-10.54306	-6.684	199	.000

Table 4: Descriptive statistics of BPD, AC , GS in days and weeks: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Biparietal diameter	200	8.70	9.76	9.2325	.23428
Abdominal circumference	200	31.34	35.98	33.4360	1.07103
Gestational age in Days	200	252.00	279.00	263.3700	6.21257
Gestational age in Weeks	200	36.00	39.86	37.6243	.88751

Mean ±S. D of Biparietal diameter were 9.2325 ±0.23428. The minimum and maximum values were 8.70 and 9.76 respectively.

DISCUSSION

Prediction of pre-natal fetal weight is part of standard antenatal care which helps to reduce maternal risks associated with pregnancy such as prolonged labor, pelvic injuries, postpartum bleeding and pre- and peri-natal fetal risks such as shoulder dystocia and birth asphyxia. Sonography is a well-established imaging modality for pre-natal fetal weight estimation. Sonography is an easily available and relatively inexpensive imaging modality in Pakistan[15].

In the study, a majority of women had sonographically estimated fetal weight of fetuses and subsequent actual birth weight within the normal range (normal fetal weight range = 2500g to 4000g; mean ABW=3393±45g). Our study was designed comparison of ultrasonographic estimated fetal weight at term with actual birth weight in Punjab[16]. Data were collected from Tahir Medical Complex Haroon Abad district Bahawalnagar. In this study total 200 pregnant women were included with single alive fetus using ultrasonographically by Hadlock formula.

A study was reported by Shittu et al. in Ife, Nigeria, the mean actual birth weight in this study was 3,242±508g. This was similar to the mean actual birth weight of 3,254± 622g, and slightly higher than 3.08 ± 0.610 Kg in Makurdi, Nigeria, and 3.10±1.89 kg in Jos. However, it is lower than 3,568±496g documented in United Kingdom[17]. The reason may be due to several factors affecting birth weight such as regional and socioeconomic factors. In our study results, two hundred pregnant females were included in this study. Mean ±S.D of estimated fetal weight were 3245.8150 ± 17.53151 Two hundred pregnant females were included in this study. Mean ±S.D of actual birth weight were 3260.7700 ± 17.80643[18].

Another similar study showed that the mean value of clinical estimation of fetal weight was 3283.27 grams and. In case of actual birth weight, the mean was 2936.20 grams. Fetal weight was estimated by USG and the mean value was 2870.41 grams. Sherman et al showed that birth weight ranges between 2500 to 4000 grams were detected more accurately by clinical method than ultrasonography. In result of their study only 34% of clinical estimate were within 10% error of actual birth weight. Sherman et al showed that somewhat lower accuracy of sonographic estimation was due to fetal weight within one week prior to delivery. They also reported that both clinical and ultrasonic estimation generally underestimates the weight of the macrosomia fetus and there was a tendency toward overestimation in cases of low birth weight.

A large study by Benacerraf et al demonstrated that 74% of the ultrasonographic estimation of fetal weight was within 10% of the actual birth weight[19].

Watson and Raman et al also suggested that both methods have similar accuracy in large fetuses. However, the study of Chauhan et al showed that the accuracy of clinical estimation of fetal weight among macrosomia fetuses were significantly better than or similar to sonographic estimation. In their study, clinical estimation of weight for large fetus was as accurate as ultrasonographic estimation. Sherman et al suggested that in the lower range of birth weight less than 2500 grams ultrasonic estimation was significantly accurate than clinical estimation.[20] In our study results, two hundred pregnant females were included in this study. Mean±S. D of estimated fetal weight were 3245.8150 ± 17.53151 Two hundred pregnant females were included in this study. Mean±S. D of actual birth weight were 3260.7700± 17.80643. Mean estimated fetal weight is significantly different from mean actual birth weight as the p – value = 0.000< α= 0.05[21].

The accuracy within 10% of actual birth weights was 69.5% and 72% for both clinical and ultrasound estimation of fetal weight, respectively, and the difference was not statistically significant. The finding in their study was comparable to the study by Shittu et al. (2007) which reported that 70% and 69% of estimated fetal weights were within 10% of actual birth for clinical and ultrasound method, respectively, and the difference was not statistically significant[22].

In another study stated that there was controversy as to whether use of FL in models for EFW improves the accuracy of prediction of birth weight. They found that the models providing the most accurate prediction included measurements of HC and/or BPD, as well as AC and FL. Attempts at improving the prediction of birth weight by the addition of maternal characteristics, such as height, weight, parity and racial origin, to fetal biometry have not been found to be successful. While in our study the result shows that two hundred pregnant females were included in this study. Mean±S. D of abdominal circumference were 33.4360±1. Mean±S.D of gestational age in days were 37.6243±0.88751, Mean±S. D of gestational age in weeks were 263.3700 ±6.21257[21].

In another similar study, there was a strong positive correlation between EFW and ABW and there was also no statistically significant difference between mean EFW and mean ABW. For microcosmic fetuses and macrocosmic babies. That we found a statistically significant difference (p<0.05) in the number of excessive weight fetuses delivered vaginally (SVD) and those delivered through Caesarian section (CS) seems an interesting result. In particular, it seems to lay further credence to the fact that the use of the Hadlock 3 fetal weight estimation model was valid in the population and also appears to suggest that the accuracy of sonographically predicted fetal weight in the population was generally high. In our study results, two hundred pregnant females were included in this study[23]. Mean ±S. D of estimated fetal weight were 3245.8150 ± 17.53151 Two hundred pregnant females were included in this study. Mean ±S. D of actual birth weight were 3260.7700 ± 17.80643. Mean estimated fetal weight is significantly different from mean actual birth weight as the p – value = 0.000 < α = 0.05.

CONCLUSION

This study indicates that estimation of Birth weight clearly has a role in management of labor and delivery in a term pregnancy. Among term singleton cephalic pregnancies studied, fetal weight estimation using Hadlock's formula is comparable to ultrasound estimâtes for predicting the actua lbirth weight within 10%. This study also revealed the mean estimated weight through ultrasound were similar to actual weight. Our results indicated the diagnostic accuracy of ultrasound in estimation of low birth weight to be considerably significant therefore it is a reliable modality for estimating fetal weight using the Biparietal diameter, head circumferenceand abdominal circumference as compared to actual birth weight.

Funding source: There is no funding source.
Conflict of interest: There is no conflict of interest.

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