Original Article



# Accuracy of Ultrasound in Predication of Birth Weight

Afshan Ahmad, Samina and Ruqia Fida


## ABSTRACT

**Objective:** To find the accuracy of ultrasound in the predication of birth weight.
**Study Design:** Cross sectional study.
**Place and Duration of Study:** This study was conducted at the Obstetrics, & Gynecology Department, the Lady Reading Hospital Peshawar & Jinnah Medical College Peshawar from 1.7.2012 to 31.12.2012.
**Materials and Methods:** All singleton pregnancies at term (37-42 weeks) with age group 15 to 45 years, attended OPD were enrolled in the study. Informed consent was taken from those participants who meets the inclusion criteria. After detailed history and clinical examination of all pregnant patients were subjected to standard obstetric ultrasound to predict fetal weight. Ultrasound EFW was obtained of all registered pregnant women's. Had lock reference tables was used for calculating diameter, abdominal circumference and femur length. Birth weight of the neonate was measured with a standard weighing machine to confirm the accuracy of the ultrasound findings. Accuracy of Ultrasound (US) was determined in terms of birth weight of the neonate. The US was considered accurate if the birth weight of the baby lies within ± 200 grams of the estimated fetal weight on US.
**Results:** A total of 159 of women with singleton pregnancies at term (diagnosed by Ultrasound), participated in this study. Mean age of patients was 29.70±5.680 SD years. Mean period of gestation at the presentation was 38 weeks with ±0.887 SD. Fetal weight calculated by ultrasound ranged from 2.50 to 4.30 gram while mean fetal weight was 3.40 gram ±0.401 SD. Actual birth weight ranged from 2.20 to 4.50 gram with mean birth weight of 3.21 ± 0.427 SD.
In the study Ultrasound EFW was accurate only in 59 (37.1%) cases i.e. only in 59 cases (37.1%) The estimate weight was ± 200gram of actual weight. while 100 out of 159 estimates (62.9%) were more than ± 200 gram from the actual weight. The over-estimated birth weight was found in 44% (70) by 307grams. Fetal ultrasound underestimated the birth weight in 18.9% (30) of the cases. Fetal ultrasound underestimated the birth weight by 195 grams. The mean error in the estimation of birth weight was 251 grams.
**Conclusion:** A significant error in EFW was found that is 250 grams of actual weight. Therefore depending on only ultrasound for EFW may lead obstetrical interventions.


**Key Words:** Sonography, Birth Weight, Fetal Weight Estimation.

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## INTRODUCTION

The Prenatal weight that is estimation of fetal weights (EFW) in labour and late pregnancy is very important in the labour management and delivery for making decisions by the obstetrician about the instrumental vagnial delivery, trail of labour after caesarean delivery and electric caesarean section for those patients having a macrosomia fetus[1,2]. Macrosomia has immense attention to increase the enhances of periental morbidity and mortality which may result of genital treat tracuma and postpartum bleeding[2].

Department of Obstetrics & Gynecology, Jinnah Medical College Peshawar.

Correspondence: Prof. Dr. Muhammad Ishaq, Chairman, Jinnah Medical College Peshawar.
Contact No: 0333-9367545 / 0313-9865097
Email: sohaib765@gmail.com

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Some researchers has found the evidence that those patients born macrosomic fetus having future health risks[3]. The importance of correct EFW values are in case of intrauterine growth is restricted and in premature labour[1].

The estimation of fetal weight (EFW), two methods are used for predicting birth weight i) ultrasonic measurement of fetal skeletal parts ii) abdominal palpation of fetal parts and calculation based on uterine height[4]. Ashraf et al 2010 – reported the use of ultrasound for fetal weight estimation the clinical use of this method is more than thirty years. Now a days Sonography is very popular and most widely, accepted method for EFW. Many studies have been conducted the usefulness of this method for monitoring normal fetal growth, intrauterine growth retardation, macrosomic and isoimmunization.[5 6 12 13]

The ultrasound based fetal weight estimation takes in account of different measurements of the fetal body integrated into different formulae. The formula based on hand- Abdomen – femur measurement showed the lowest percentage error[7].

The sensitivity and specifically of birth weight prediction by ultrasound method was 92.1% and by palpation was 99.6%.[8] In one study, The accuracy of ultrasound for estimation of fetal weight has been reported to be 72.2%[9].

The aim of this research work was to find out the accuracy of ultrasound in the determination of normal fetal weight similar to production any birth weight of the body. The finding of this results will providing and the anthropological variation with no population can change the predicted equation for sonographic fetal weight estimation. Moreover, estimated fatal weight is an important non invasive and cheap parameter to decide in mode of delivery which is easily available before delivery. It will help to avoid unnecessary caesarean deliveries especially for obstetrician anxiety in case of good size bay. On the other hand, estimating fetal weight beforehand can predict difficult delivery and complication like shoulder dystocia, in which cases caesarean delivery can be planned.

## MATERIALS AND METHODS

The study was conducted at the department of obstetrics and Gynaecology, The Lady Reading Hospital Peshawar, and Jinnah Teaching Hospital Peshawar. The duration of study was six months from the date of approval. The sample size 159 keeping 72.2% of proportion of accuracy of ultrasound in EFW. The Margin of error as WHO sample size calculation. Non probability consecutive sampling techniques was used.

**Sample Selection:**

- All singleton pregnancies at term (37-42 weeks)
- Age group 15 to 45 years.
- BMI < 25.

**Exclusion Criteria:**

- BMI > 25
- Preterm pregnancies (< 37 weeks)
- Any congenital malformation, including hydrops fetalis, sacrococcygeal teratoma
- Any liquor abnormality, i-e polyhydramnios or oligohydramnios
- Multiple pregnancies

**Data Collection:** The study was started after approval of ethical committee of Jinnah Medical College. All pregnant women were attended the OPD were included the benefits of this study was explained and a consent form was obtained. The detail history and clinical examination followed by standard obstetric ultrasound to predict fetal weight. The Ultrasound examination was conducted signal experienced radiologist. All the women were followed over till delivery. Ultrasound was repeated after 7 days for calculating fetal weight if patient did not deliver within a week of ultrasound. Birth weight of the neonate was obtained using a standard weighting machine to confirm the accuracy of the ultrasound.

Strict exclusion criteria was adopted to control confounders and bias in the study results.

**Data Analysis:** The collected data was analyzed in SPSS version 15. Mean ± SD was calculated for numerical variables like age, fetal weight on ultrasound and birth weight of the neonate. Frequencies and percentages were calculated for categorical variables like accuracy. Accuracy was stratified among age to see the effect modifications.

## RESULTS

A total of 159 of women with singleton pregnancies at term (diagnosed by Ultarsound) participated in this study. Age of the population ranged from 15 to 40 years, with mean age of 29.70±5.680 SD years. Most common age group was 20-30 years.

All patients included in this study were in their third trimester. Period of gestation ranged from 37 to 40 weeks. Mean period of gestation at the presentation was 38 weeks with ±0.887 SD.

Regarding obstetrical history of the study population, most patients presented with gravida 3 and para 1. The highest gravida was 13 and highest para was 12 while the lowest gravid was 1 i.e. primigravida.

Most of the patients belonged to the district Peshawar and only few patients were from other districts. Most patients included in this study were from Peshawar (53), Nowshehra (23), Mardan (21), Charsadda (17) and district Sawabi (10) respectively of 159 patients 6 (3.8%) were also from Afghanistan.

Ultrasound EFW was obtained for all women using standard Hadlock reference tables that used biparietal diameter, abdominal circumference and femur length for calculating fetal weight. Estimated Fetal weight ranged from 2.50 to 4.30 gram. Mean weight was 3.40 gram ± 0.401 SD. Birth weight was measured immediately after birth using a standard weighing machine in grams.

Actual birth weight ranged from 2.20 to 4.50 gram. Mean birth weight was 3.21 ± 0.427 SD (Table 01).

Accuracy of Ultrasound was determined in term of birth weight of the neonate. The US was considered accurate if the birth weight of the baby lied within ±200 grams of the estimated fetal weight on US. In this study EFW by ultrasound was accurate in 59 patients (37.1%) while in 100 patients (62.9%) it was not accurate in predicting birth weight (Table 2).

Table 3 indicating error found in estimation of birth weight in 44% (70) of the patients or predicted birth weight finding by ultrasound studies were 307grams. 18.9% (30) cases showed underpridicted birth weight by an average of 195grams. Thus in our study the mean error in the prediction of birth weight was 251 gram. In

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this study, only 59 patients (37.1%) estimates were within ± 200 grams off from the actual weight.

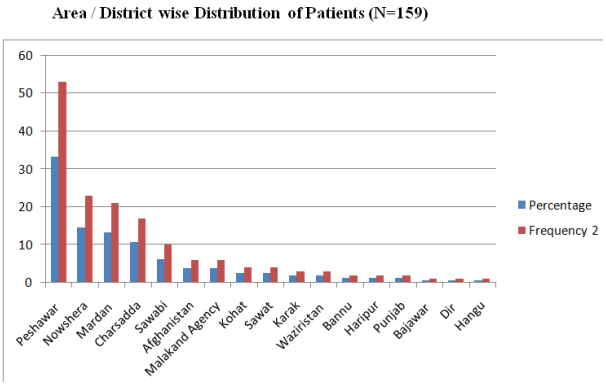


**Figure No.1: Area / District wise Distribution of Patients. Frequency & Percentage (N=159)**

We also stratified the accuracy of fetal ultrasound for weight estimation with age of the patient and duration of gestation effect modification. Chi-square test was applied to see whether the effect of these factors on the accuracy of ultrasound was significant or not. However the effect of both the parameters on the accuracy of ultrasound was statistically not significant (p-vale< 0.05) (Table 4 and 5).

**Table No.1: Fetal Weight as Measured by Ultrasound and Weight Machine after birth (N=159)**

| | Minimum | Maximum | Mean | S.D |
|---|---|---|---|---|
| Fetal Weight on U/S (Kg) | 2.50 | 4.30 | 3.40 | 0.428 |
| Neonate's Birth | 2.20 | 4.50 | 3.21 | 0.427 |

**Table No.2: Accuracy of Ultrasound in the estimation of Fetal Weight (N=159)**

| Accuracy of ultrasound | Frequency | Percent |
|---|---|---|
| Yes | 59 | 37.1 |
| No | 100 | 62.9 |
| Total | 159 | 100.0 |

**Table 3:Error Estimation of Ultrasound (N=159)**

| Estimation | Frequency | Percent | Minimum | Maximum | Mean | S.D | Std. Error of Mean |
|---|---|---|---|---|---|---|---|
| Accurate | 59 | 37.1 | 2.50 | 4.30 | 3.303 | .42547 | .05539 |
| Over predicted | 70 | 44.0 | 2.70 | 4.20 | 3.610 | .33252 | .03974 |
| Under predicted | 30 | 18.9 | 2.70 | 3.90 | 3.105 | .39955 | .07295 |
| Total | 159 | 100 | 2.50 | 4.30 | 3.401 | .42887 | .03401 |

**Table No.4: Stratification of accuracy of Ultrasound Against different Age groups (N=159)**

| Accuracy of Ultrasound | Age Groups (years) | | | |
|---|---|---|---|---|
| | <20 | 20-30 | 31-45 | <20 |
| Yes | 5 | 32 | 22 | 59 |
| No | 6 | 51 | 43 | 100 |
| | 11 | 83 | 65 | 159 |

P-value 0.705

**Table No.5: Stratification of Accuracy of Ultrasound Against different Gestational Ages (N=159)**

| Accuracy | Gestational Age | | | | |
|---|---|---|---|---|---|
| | 40 weeks | 37 Weeks | 38 Weeks | 39 Weeks | Total |
| Yes | 8 | 18 | 17 | 16 | 59 |
| No | 7 | 36 | 34 | 23 | 100 |
| | 15 | 54 | 51 | 39 | 159 |

P-value: 0.450

# DISCUSSION

In the management of pregnancy the fetal weight estimation is very important. It helps to predict fetal outcome, and helps the mode of delivery. Accurate EFW has been reduces the preinatal morbidity and morality associated with high risks pregnancy such as intrauterine growth retardation macrosomia and prematurity. EFW was done with ultrasonography most commonly using hadlock`s formula.[7] weight determination line range of 10% of actual birth weight is considered acceptable accuracy in most of studies[8] is about 75% results[9]. In this study (37%) estimates were in 10% range. Overpredicted birth weight found by ultrasound in 44% of cases was 307 grams similarly under predicted fetal weight in 19% cases by 165 grams, the results of our study showed that ultrasonography an error 251 grams in predicting the birth weight which was reported by other studies[10]. High estimation errors ws found by ultrasound. The fetal ultrasound may lead to unnecessary stress, anxiety and some time unnecessary obstetrical interventions. Contrary to some studies we reported a high percentage of error in the estimation of the fetal weight by ultrasound. The difference may be due to multiple factors including genetic, environmental and even inter and intra operator variation. More over the accuracy of a given formula decreases as the model deviates from the population from which it is derived, therefore, population specific measurements should be done since anthropological variations may change the various coefficients.

Although in this study birth weight was measured immediately after birth using a standard weighing machine in grams. Some authors studying reliability of ultrasound estimation of fetal weight have included estimations performed up to 14 days prior to delivery,

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[11]other have restricted their data to estimations performed within 3 to 7 days [12]. [13] or have attempted to correct for the time elapsed between the ultrasound and delivery by the addition of 25 g per day or 12.4g or 13.0 g per day. [14] Therefore variation in fetal weight estimations in different time and days after delivery. 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

From the results of our study it is concluded that:

- Most patients were below 30 years age.
- Mean period of gestation was 38 weeks.
- ON average ultrasound overestimated the fetal weight by 307 grams and underestimated the fetal weight by 195 grams.
- The mean error in the estimation of birth weight was 251 gram and only 37% estimates were within ± 200 grams of the actual weight.

A significant error in EFW was found that is 250 grams of actual weight. Therefore depending on only ultrasound for EFW may lead obstetrical interventions, it is recommended that ultrasound finding must be corrected with clinical examination for estimation of fetal weight. Before making any decision regarding future management of delivery.

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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