

Evaluating Ultrasonography Fetal Weight in Comparison to Actual Birth Weight in Term Pregnant Women at Tertiary Care Center Hospital

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ABSTRACT

Background: Prenatal mortality is very high in Pakistan. One of the most reasons is low birth weight and preterm babies. Hence, estimating the baby's weight is paramount in antenatal care. Birth weight refers to the body weight of a newborn. Multiple elements, like genetics epigenetics, nutritional and environmental factors can influence fetal weight. Ultrasonography is an important non-invasive tool for fetal weight estimation in normal and high-risk pregnancies. The role of ultrasound as a safe and non-invasive measurement for fetal growth and weight in pregnancy is well established.

Objective: To determine the relationship between Sonographic fetal weight estimation in the prenatal period and definite birth weight in pregnant women in a multidisciplinary hospital set up

Study design: A comparative study

Place and Duration: Study was conducted in Department of Radiology, Chiniot General Hospital Korangi Karachi from January 2022 to June 2022 for six months duration.

Methodology: The sample size is 50. Expecting mothers were taken in this study. These women were booked and they underwent an ultrasound examination of fetal weight in a prenatal period which was then correlated to actual fetal weight after birth by a pediatrician. Fetal weight was estimated and noted. It was measured by using Hadlock's formula: $\log(10) \text{ birth weight} = 1.335 - 0.0034(\text{abdominal circumference}) + 0.0316(\text{Biparietal diameter}) + 0.0457(\text{abdominal circumference}) + 0.1623(\text{femur length})$.

Results: Most of our patients were between 20-30 year age brackets. There was a strong linear relationship between ultrasound fetal weight and real birth weight. The mean age of females was 26.12 ± 5.65 years, and the mean BMI of patients was $26.17 \pm 4.19 \text{ kg/m}^2$. A strong positive correlation ($r=0.575$, $p<0.05$) was found between the fetal weight estimation on USG and actual birth weight.

Conclusion: This study shows that ultrasound can be a valuable method of assessing fetal weight in pregnant women. Hence ultrasound can be used for informed decision-making for birthing decisions in expecting mothers.

Keywords: Correlation, Ultrasonography, Birth Weight, Fetal

INTRODUCTION

Assessing fetal weight is a crucial feature of prenatal management not only for decision-making regarding birthing plans but also for assessing fetal biometry and fetal growth restriction. An infant's Birth weight is the single factor determining their chances of survival.¹ Essentially the obstetricians categorise the birth weights into three groups: small babies less than 2.5 kg, usual birth weight between 2.5-3.5 kg and large sized between 3.5-4.5kg². It is well known that both very small and very big size fetuses can have a number of difficulties in labour and delivery.² Hence accurate estimations of fetal weight will improve decision-making and avoid preventable complications in labour and delivery.³

In order to minimize the risks to both mother and fetus it's crucial to have proper weight estimates before labor hence delivery management plans are instituted.⁴ Clinicians usually estimate fetal weight through subjective symphysis fundal height to determine approx size. This has to be potentiated with the biometry of the fetus which is done ultrasonographically to measure Bi parietal diameters, femur length, abdominal circumference and head circumference.⁵ It has indeed shown good precision.⁶

Numerous formulations have been used ultrasonographically to measure fetal weight prenatally. The most common is the Hedlock method, which is pre-programmed in the ultrasound machine used in our department. This uses the biometry parameters like the head, femur and abdomen measurements to calculate fetal gestation and weight. This formula has been shown to be most predictive in studies.⁵

The purpose of our research was to investigate the strength of the relationship between Ultrasonographic fetal weights with actual baby weight on birth presenting in a multidisciplinary setup. Existing research has shown conflicting reports on the topic, and there is a lack of local evidence which could help establish the value of ultrasound as an accurate weight measurement in an

antenatal period as compared to weight at birth. Therefore the objective of this study is to validate previous findings and improve clinical practice by establishing specific protocols for diagnosing and calculating prenatal weight, ultimately improving the care and planning appropriately to avoid hazards and improve outcomes

METHODOLOGY

Study was conducted in Department of Radiology, Chiniot General Hospital Korangi Karachi for six months duration from January 2022 to June 2022. A sample size of 50 cases was calculated with a 95% confidence level, 5% type I error, 10% type II error and taking the magnitude of correlation coefficient i.e.=0.69 between¹ ultrasound estimated fetal weights and actual birth weights in pregnant females. Non-probability, consecutive sampling technique was used.

Inclusion Criteria: Pregnant women between 20-40 years, parity<5 presenting at gestational age> 34 weeks (on LMP).

Exclusion Criteria: Extremely high or low BMI, women having drainage of liquor, antepartum hemorrhage, congenital anomalies, High blood pressure, convulsions, deranged liver or renal functions.

Data Collection Procedure: Women having normal pregnancies and falling in inclusion criteria n=50 were selected and were sent to focal persons in radiology for growth scans. Detail consent was taken and patients were reassured that their confidentiality and safety will not be compromised. Age, parity, weight, ethnicity and household income were documented. Henceforth research specific ultrasound was done by the primary investigator. Fetal weight was estimated and noted. It was measured by using Hadlock's formula: $\log(10) \text{ birth weight} = 1.335 - 0.0034(\text{abdominal circumference}) + 0.0316(\text{Biparietal diameter}) + 0.0457(\text{abdominal circumference}) + 0.1623(\text{femur length})$. Then all females were sent to deliver at the

Department of Obstetrics & Gynecology. On delivery, the baby's weight was documented by a pediatrician in kilograms on a standard baby weighing machine. The medical record of our selected patients was then assessed to recheck the weight and document the research performa.

Data Analysis: All data were recorded and evaluated in SPSS version 20.0. The numerical data like age, gestational age, BMI, ultrasound estimated prenatal weights and appropriate birth weights were calculated as mean ± SD. The categorical data were summarized in percentages and frequency. Parity was documented as frequency. Pearson's correlation coefficient was applied to calculate the measurement between the sonographic fetal projected eight and the real-time post-birth weight of the baby. A P-value of ≤0.05 was taken as significant.

Ethics: Patients within the set criteria were approached and the purpose of the study was detailed out, the detailed consent form was filled with permission. Patients were told they can withdraw at any point if they weren't comfortable. The confidentiality and privacy of participants were maintained, all participants were ensured for maintaining anonymity and data will only be used in the aggregate for research

RESULTS

Most of the patients in our sample were in the second decade. The average weight of most of the patients was around 26.17±4.19 kg/ m². The mean gestational age of the females was 36.20±2.41 weeks. In this study, we had 12(24%) females who were in their first pregnancy, 18(36%) females had parity 1, 19(18%) females were para 2, 7(14%) females had parity 3, 2(4%) female had parity 4, and 1 (2%) females had parity 5 and 6 respectively. As per gender, there were one-third male babies and two-thirds babies were females. The gender distribution was more female than male babies. The mean fetal weight on USG of the babies was 2.52±0.34 kg. The mean actual birth weight of the babies was 2.66±0.42 kg. (As shown in Tables 1 and 2) Hence we saw that real birth weight was almost accurately depicted by sonographic prenatal weight.

Table 1: Maternal and Fetal characteristics

N	50
Age(years)	26.12±5.65
BMI(kg/m ²)	26.17±4.19
Gestational age (weeks)	36.20±2.41
Primigravida	12(24%)

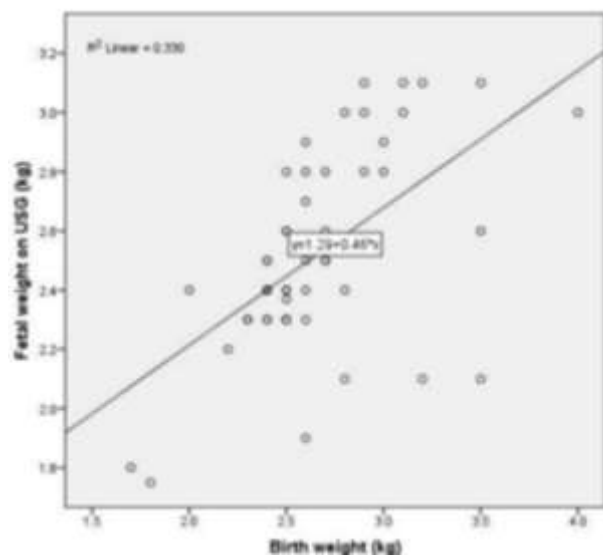


Figure 1: Correlation between fetal weight estimation on USG with actual birth weight r=0.575 (p-value=0.000)

Table 2: Various characteristics of the study participants

Primiparous	18(36%)
Multiparous	18(36%)
Grand Multiparity	2(4%)
Male neonate	19(38%)
Female neonate	31(62%)
Fetal weight on ultrasound (Kg)	2.52±0.34
Actual birth weight (Kg)	2.66±0.42

DISCUSSION

Our research was focused on exploring the precision of ultrasound modality to estimate fetal weight accurately. Our research like many others found the strong value of ultrasound in measuring fetal weight. Accurate measurement of newborn weight assessment is one of the most important parameters to determine the course and plan of labour. In the management of labour and delivery. Predicting prenatal fetal weight is a standard important milestone in antenatal care, aiming to minimize long labour, perineal tears, instrumental and operative delivery and massive bleeding thereafter. Fetal risks like shoulder dystocia and birth asphyxia. Sonography is a well-established readily available imaging technique for estimating Fetal Weight (EFW) and fetal biometry to exclude and screen for fetal growth disorders.¹⁰ Many studies including this Nigerian study by Cletus Uche Eze et al⁶ reported the positive association of sonographic estimated fetal weight with actual birth weight in a tertiary hospital in Lagos, Nigeria. These authors used hadlock 3 weight estimation on ultrasound and found it was in parallel with the measurement of the real post-delivery weight of neonates.

Literature is abundant with studies that fetal biometry and its relationship with birth weight. Our study also validated this important aspect. Simms-Stewart D et al research showed when residents and postgraduates are doing weight assessments than too the association with actual birth weight is strong at their center. Although our study showed positive fetal estimated birth weight on sonography with the real neonatal weight i.e. =0.575(p<0.05), another study reported a stronger link (r=0.961, p<0.001) between antenatal weight estimation and newborn weight. This enhances the evidence that ultrasound is a reliable tool for baby weight estimation and identifying the cases of fetal growth restriction (FGR) as well as large for dates newborns.¹¹

There is abundant literature showing the usefulness of sonographic weight measurement with newborn weight showing more power than our study such as r=0.69 (p<0.001) and r=0.835, with a majority of assessments falling within close range of the actual birth weight. Various studies have also highlighted the better diagnostic powers of sonographic and clinical methods small for gestation and large fetuses respectively. Ultrasound assessment has demonstrated safety, reliability, and sensitivity in estimating fetal weight with better accuracy in detecting weights above certain threshold.^{12, 13} Hence many studies provide evidence of prenatal Ultrasonographic fetal weight and its positive relationship with newborns in normal low-risk pregnancies

Authors like Ugwa EA et al¹⁴ combined sonographic measurements and clinical findings to accurately measure fetal growth restricted or constitutional small and big size babies. They resolved that clinical suspicion and screening followed by ultrasound yields good positive predictability for normal weight and macrosomic fetuses. Good precision of ultrasonography was observed in the study of Gerard G Nahum et al.¹⁵ These authors maintained that not only term but sonography is more than 87% accurate for preterm babies.¹⁵

The studies on safety done by various researchers including El Helali A et al henceforth provided evidence for the safety and reliability of ultrasound assessment for fetal weight estimation. Measurements of big neonates that are more than 3.5 kg are shown to be more precisely measured by Ultrasound. Plus it shows more accuracy in Bland-Altman plot analysis. In comparing the clinical weight assessments with ultrasonic weight assessments, there is abundant literature to support ultrasound as

a superior modality as clinical assessments are prone to be subjective^{16, 17} It is suggested that in the future further studies be conducted on this topic with a greater number and if possible randomized to evaluate the findings of our research.

Strength and limitations: There are limited studies on fetal growth estimation from Pakistan and considering high perinatal mortality it's indeed need of hour. The study was done at a tertiary care center having radiological and gynecological expertise. The sample size was limited and it was only done in women with no commodities. It was done at one center only hence generalizability will not be possible

CONCLUSION

Our paper establishes ultrasound as a reliable, valid and safe tool for measuring fetal weight in the antenatal period and shows its robust relationship with neonatal weight. So as per our research ultrasound can be safely used in the prenatal period for biometry and weight estimation.

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