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Comparison of fetal weight by ultrasound with actual birth weight

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ABSTRACT

Introduction: Comparison of fetal weight by ultrasound with actual birth weight is significant for clinical management as it is very closely linked with the survival and well-being of a fetus. Sonographic fetal weight estimation is an essential component of antenatal care. Hence, ultrasonography has become a vital tool in modern obstetrics practice. However, the reliability of the result depends a lot on the quality of the machine and the skill of the sonographer. Actual birth weights are measured with a scale corrected for zero error before use.

Methods: This is a retrospective study in which clients under regular follow-up were sent from the Gynaecology and Obstetrics department, undergoing routine antenatal ultrasound to assess fetal well-being. Considering ultrasound at term (37-41 weeks), the data were retrieved, and a comparison was made between fetal weight by ultrasound and actual birth weight.

Results: Women, 214 in number, who delivered in Patan Academy of Health Sciences were enrolled in this study. The mean estimated fetal weight was 2995.11(± SD 383.42) grams, and the mean of actual birth weight was 3033.15 (± SD 501.47) grams. The correlation coefficient between fetal weight estimated by USG and actual birth weight was 0.907 ($p < 0.001$), indicating a strong positive linear correlation.

Conclusion: Ultrasonography is an essential tool for estimating fetal weight before delivery in term pregnancies, with no significant difference from actual birth weight.

Keywords: Actual birth weight , Comparison, Estimated fetal weight, Ultrasonography

INTRODUCTION

Accurate estimation of intrapartum fetal weight is very important for clinical management, as it is closely linked to the survival and well-being of the fetus. Among the available intrapartum fetal weight estimation methods, ultrasound-based estimation is the readily available and widely practiced technique and is superior to clinical methods.[1–4] However, no single ultrasound-based model is equally applicable across all populations. Sonographic fetal weight estimation is an important component of antenatal care, as it was found to be a more reliable method to establish fetal weight at term and more consistent in various periods of gestation, predominantly using the Hadlock formula, which is shown by multiple studies, including a systematic review article.[1,5–7] Actual birth weight is measured with a weighing scale which is corrected for zero error before use in the pediatric unit by the pediatrician.[8,9] Fetal weight is a determinant of pregnancy outcome and infant mortality, and for diagnosing intrauterine growth restriction (IUGR) and macrosomic fetuses.[8] Ultrasound machines have become a vital tool in modern obstetrics practice. However, the reliability of the result depends a lot on the quality of the machine and the skill of the sonographer. Our study aimed to correlate the association of estimated fetal weight by ultrasonography and measured actual birth weight.

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METHODS

This is a retrospective observational study done in the Department of Radiology and Imaging, and Gynaecology & Obstetrics of Patan Hospital, Patan Academy of Health Sciences, Lagankhel, for a period of 3 years, from 2017 to 2020. The data were collected from the compiled medical record files of Patan Hospital. All the pregnant women who delivered and had an actual birth weight record in the Gynecology and Obstetrics department of PAHS, along with a routine fetal well-being scan done within the past 1 week, within the department of radiology at the PAHS.

Transabdominal ultrasound (USG) at term pregnancy (37-41weeks) was carried out by Philips (Affinity 50G) machine with the help of a curvilinear probe (2-5 MHZ). Obstetrical parameters biparietal diameter (BPD), head circumference (HC), femur length (FL) & abdominal circumference (AC) were calculated using the Hadlock formula,[5,10] which was preset in the machine itself. BPD was taken on an axial plane that traverses the thalami and cavum septum pellucidum with the intersection of the calipers placed on the outer border of the upper and lower parietal bones. HC is the measurement of an ellipse, which is drawn around the outside of the calvarium. FL was traced with the transducer aligned along the long axis of bone, perpendicular to the shaft, where the ends of the bones are blunt and not pointed, and measured from the blunt end of the proximal femoral epiphysis to the blunt end of the distal femoral epiphysis. AC was traced in a transverse section through the upper abdomen, demonstrating fetal stomach, umbilical vein and portal sinus as landmarks such that heart, kidneys and umbilical cord insertion site are noted included on the same plane, with the calipers placed on the outer skin surface. The interval between last term USG and delivery was 1-6 days.[5] Calculation of fetal weight was assessed using software installed in the ultrasound machine. Singleton pregnancies and women who did ANC including ultrasound, and delivered at Patan Hospital were included in the study. Twin/Multiple pregnancies and elderly gravida, age >40 years, were excluded. Actual birth weight was measured using a calibrated scale soon after delivery, with the scale zeroed before each reading. The collected data was compiled from the record section, then entered in a spreadsheet and stored in a computer. This data was analyzed using IBM SPSS software and the descriptive results were presented in numerical value and percentage for the categorical

variables and mean and standard deviation for the normally distributed numerical variables. Independent samples t-test, Pearson's correlation coefficient and Intra-class correlation coefficient were used to assess the relationship and agreement between estimated and actual birth weights.

RESULTS

In this study, the number of women who had both ANC and delivery was 214, and thus the final sample size was 214.

Most of the participants, 130 (60.75%), were in the age group 26-35 years. There were 112(52.3%) primigravidae. Amongst the multigravida females, 77(36%) were in 2nd gravida, 20(9.3%) were in 3rd gravida, 4(1.9%) were 4th gravida and 1(0.5%) had gravida 9.

While considering the parity, most of them, 136(63.6%) were nulliparous, 64 (29.9%) had a single previous child, 12(5.6%) had previously had 2 children, and 2(1%) had already given birth to 3 children.

The estimated fetal weight by ultrasound in the <2.0 kg group was 3 (1.4%), in the 2.0-2.5 kg group, there were 14 (6.5%), in the 2.6-3.0kg group, there were 81 cases (37.9%), and in the>3 kg group, there were 116 (54.2%) cases.

There were 4 (1.9%) neonates with measured actual birth weight in < 2.0 kg group, 18 (8.4 %) in 2-2.5 kg group, 60 (28%) in 2.6-3 kg group, and the majority 132(61.7 %) neonates with measured actual birth weight in>3kg group as shown below (Table 1).

There was no significant difference on the mean fetal weight obtained from USG and direct birth weight measurement with (t value of 0.882 and p-value of 0.379) using Independent samples t-test as shown below on (Table 2).

This study shows a high degree of positive linear correlation between the USG estimated and actual birth weight measured fetuses with Pearson's correlation coefficient (r of 0.907 and p-value of < 0.001) as shown in (Table 3).

The agreement coefficient for two random observations obtained from ICC2 was 0.932, and the P-value < 0.001, suggesting excellent agreement between the estimated birth weight from USG and directly measured birth weight at the time of the birth.

DISCUSSION

A total of 214 pregnant women under < 40 years were enrolled, with a maximum of 130 women in the age group 26-35 years, which corresponded to the mean maternal age of 30.77 in the study carried out by Chisolum Ogechukwu Okafor et al.[8]

Pearson's correlation r with a value of .907 and p-value of <0.001 was obtained, meaning that there is a high degree of positive linear correlation (association)between estimated and actual fetal weight. This result is highly significant statistically, as the p-value is less than 0.001. This is comparable to the study carried by El Helali A et al.[11] Pearson's correlation coefficient of 0.778 in the study carried out by Johannes Stubert et.al,[12] also correlated well with actual birth weight, similar to our research.

The mean birth weight was 3033.15, which is comparable to values reported from Nepal and Bangladesh and lower than those reported from Lagos, Nigeria.[8] This difference could be linked to the gestational age at scanning and the genetic and racial variations. We found the mean estimated fetal weight by ultrasonography (UEFW) was 2995.11 g with minimum and maximum UEFW being 1535 and 4200 g, respectively, which were higher than the values compared to the study carried by Rabia Razak et al,13 where the UEFW was 2227.77 g with minimum and maximum UEFW being 1465 and 3177.40 g, respectively. We had a mean measured actual birth weight (ABW) of 3033.15 g with a minimum and maximum ABW values of 1500 and 4900 g, respectively, which also showed higher values than in the study carried by Rabia Razak et al,[13] which showed that ABW of the patients was 2284 g with a minimum and maximum values of 1400 and 3400 g, respectively.

Table 1: Frequency distribution of the study variables

Category	N(%)
Age Group	
18–25	75 (35.0%)
26–35	130 (60.8%)
36–42	9 (4.2%)
Gravida	
1	112 (52.3%)
2	77 (36.0%)
3	20 (9.3%)
4	4 (1.9%)
5	1 (0.5%)
Parity	
0	136 (63.6%)
1	64 (29.9%)
2	12 (5.6%)
3	2 (1.0%)
Past history of abortion	
0	178 (83.1%)
1	31 (14.5%)
2	3 (1.4%)
3	1 (0.5%)
6	1 (0.5%)
Past history of bleeding	
No	108 (50.5%)
Yes	106 (49.5%)
Past history of abdominal pain	
No	8 (3.7%)
Yes	206 (96.3%)
Fetal weight- estimated(USG)	
<2.0 kg	3 (1.4%)
2.0–2.5 kg	14 (6.5%)
2.6–3.0 kg	81 (37.9%)
>3.0 kg	116 (54.2%)
Fetal weight-measured (ABW)	
<2.0 kg	4 (1.9%)
2.0–2.5 kg	18 (8.4%)
2.6–3.0 kg	60 (28.0%)
>3.0 kg	132 (61.7%)

Table 2: Descriptive analysis of fetal weight with estimated fetal weight

Variable	Mean ± SD (grams)	Min	Max	T test	p-value
Estimated fetal weight	2995.11 ± 383.42	1535	4200	0.882	0.379
Actual birth weight	3033.15 ± 501.47	1500	4900		

The concordance coefficient, Kendall's ICC2 coefficient value, was 0.932, and the p-value was<0.001, meaning that there was excellent agreement between the estimated birth weight from USG and the directly measured birth weight at the time of the birth. The study by Rabia Razak et al[13] found out that there is a positive correlation between

UEFW and ABW (r=0.927) which correlated with our study.

Table 3: Correlation of fetal weight by ultrasound with respect to actual birth weight

	Value	Interpretation	p-value
Pearson's correlation coefficient (r)	0 .907	r > 0.75 = High degree r < 0.75 but > 0.25 = Moderate degree r < 0.25 = Low degree	<0.001

Table 4: Agreement between fetal weight by ultrasound with respect to actual birth weight

	Value	Interpretation	P-value
Intra-class correlation for two observation agreement (ICC2)	0.932	ICC2 > 0.90 = Excellent ICC2 > 0.75 but < 0.90 = Good ICC2 > 0.3 but < 0.5 = Average ICC2 < 0.5 = Poor	<0.001

Pearson's correlation coefficient (r) was .907, and it was statistically significant (p-value < 0.001). This means there was a high positive linear correlation (association) between estimated and measured fetal weight. This result was highly significant statistically, as the p-value was less than 0.001. Sajida Parveen et al.[13] in their study concluded that UEFW correlates with actual birth weight when performed in the late 3rd trimester, which is consistent with the findings. Using the simple linear regression fit, ANOVA yielded an F-test statistic of 983.18 and a p-value <0.001. This signified that, since the regression ANOVA was highly significant, the fitted model was valid. This finding was supported by Pearson's correlation, with a coefficient of .907 and a p-value <0.001, indicating that the two scores were not different. Johannes Stubert et al., in their study, demonstrated that the comparison of categorical variables UEFW and ABW was calculated using the chi-square test or Fisher's exact test. P-value <0.05 was considered statistically significant.[12]

A study by Alshoabi et al., who studied the patients with sonographically estimated fetal weight on the same day or a day prior it showed strong compatibility (with r = 0.82, p < 0.001) and strong correlation between (R = 0.875, R2 = 0.766, and p < 0.001) between the estimated fetal weight and actual birth weight. which was similar to our study.[14] Similar study by Ero-phillips et al. showed strong correlation with (r = 0.669, p value <0.001).[15]

Similar study by Bora et al. who evaluated in the differences between the sonographic weight and actual birth weight in pregnant females who delivered within 10 days of sonographic evaluation shows no significant differences in the birth weight suggesting that sonographic evaluation is accurate at evaluating the birth weight.[16] Another study by Sharma et al. showed that there was a strong positive correlation between estimated fetal weight and actual birth weight (r = 0.58, p value < 0.001); however, the correlation coefficient was less compared to our study. This could be due to the patient factor and the average day from the sonography to the date of delivery, as neither this nor our study has taken into account the average daily weight gain of the fetus. However, such evaluation is very variable. This could be ameliorated by using the lowest gap between the date of the delivery and the last scan.[17] This is also supported by the study by Tuten et al., which showed that duration since examination to delivery was significantly associated with differences in the estimated and actual birth weight.[18]

A new study by Horky et al. comparing the estimated fetal weight and actual birth weight in patients with C-section within 1-4 days by residents, experienced radiologists and AI supported algorithm based methods showed that all the groups underestimated the fetal weight even after adjusting the daily fetal weight gain with least variability in the evaluation done by the experienced radiologists, suggesting that AI based algorithms should be evaluated appropriately before introducing into the clinical practice.[19]

The limitations of this study were not including the average daily weight gain of the fetuses examined days prior to delivery, a limited sample size, and the exclusion of postdated pregnancy. Also, we did not include the variability in skin-to-uterus distance in our study, which had a direct correlation with sonographic accuracy.[20]

CONCLUSION

Ultrasonography is an essential tool for estimating fetal weight before delivery in term pregnancies, and it correlates well with the babies' actual birth weight.

DECLARATION

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Shital Bhandary

Author Contributions

YD, SS reviewed the literature, conceptualized and designed the research; PK,PJ,DM did data collection, analysis, and prepared the results; NRB,RN drafted the manuscript; and all authors reviewed the manuscript and approved the final version of the manuscript. All authors agreed to be accountable for all aspects of the research work.

Ethical Approval

This research was approved by IRC of Patan Academy of health Sciences with the reference number of drs2106291546 on 29th June 2021.

Consent/Assent

Not Applicable

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request)

Conflicts of Interest

Authors declare no conflict of interest.

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REFERENCES

1. Fleming A, Riva JD, McAdoo G. Estimation of Fetal Weight by Ultrasound in Term Pregnancy. J Diagn Med Sonogr. 1996 Jan 1;12(1):7–10. | DOI |
2. Fatima SA, Devi VVLA, Kallur MB, Basha NM, Kabir MA. A comparative study on estimation of fetal weight in term pregnancy by clinical methods and USG with actual birth weight in a tertiary care center. Int J Health Sci. 2022 July 27;6(S8):1165–74. | DOI |
3. Ugwu E, Udealor PC, Dim CC, Obi SN, Ozumba BC, Okeke DO, Agu PU. Accuracy of clinical and ultrasound estimation of fetal weight in predicting actual birth weight in Enugu, Southeastern Nigeria. Nigerian journal of clinical practice. 2014 May 28;17(3):270-5. | PubMed |
4. Odekunle J, Ojurongbe A, Pam S, Tunde-Olatunji O, Ayanwuyi S, Atsukwei D, Fijabi M, Taiwo W. Accuracy of Clinical and Ultrasound Foetal Weight Estimation in Predicting the Actual Birth Weight at Term at Federal Medical Centre, Keffi, Nasarawa State. AJFMED. 2022 Oct 13;1(1):38-43. | Weblink |
5. Ganesh S, Jyothi GS, Poojashree KS. Accuracy in Fetal Weight Estimation by Ultrasound: A Comparative Study of Hiwale and

Hadlock Methods in a Tertiary Care Hospital. J Obstet Gynaecol India. 2025 Aug;75(4):318–23. | DOI |

6. Ramesh S, Vidhyalakshmi D, Tripathy S, Nandi D. A Comparative Study of Clinical and Sonographic Fetal Weight Estimation at Term with the Actual Birth Weight Keywords. J Coast Life Med. 2023 Oct 13;10:711–21. | Full Text |

7. Milner J, Arezina J. The accuracy of ultrasound estimation of fetal weight in comparison to birth weight: A systematic review. Ultrasound Leeds Engl. 2018 Feb;26(1):32–41. | DOI |

8. Okafor CO, Okafor CI, Mbachu II, Obionwu IC, Aronu ME. Correlation of Ultrasonographic Estimation of Fetal Weight with Actual Birth Weight as Seen in a Private Specialist Hospital in South East Nigeria. Int J Reprod Med. 2019;2019:3693797. | DOI |

9. Shapla NR, Aleem MA, Jesmin E, Ahmed H, Lepe YS. Correlation between Estimated Fetal Weight at Term by Ultrasonogram and Actual Birth Weight. J Bangladesh Coll Physicians Surg. 2014 Nov 30;32(1):21–5. | DOI |

10. Hadlock FP, Harrist RB, Sharman RS, Deter RL, Park SK. Estimation of fetal weight with the use of head, body, and femur measurements—A prospective study. Am J Obstet Gynecol. 1985 Feb;151(3):333–7. | DOI |

11. Amr abd el Fattah El Helali , Amal el Shabrawi El Sayed, Wesal Hamdi Ali Hassan, (2018) Sonographic Versus Clinical Fetal Weight Estimation Accuracy. J. Obstetrics Gynecology and Reproductive Sciences. 2018;2(1);1-5. | DOI |

12. Stubert J, Peschel A, Bolz M, Glass A, Gerber B. Accuracy of immediate antepartum ultrasound estimated fetal weight and its impact on mode of delivery and outcome - a cohort analysis. BMC Pregnancy Childbirth. 2018 May 2;18(1):118. | DOI |

13. Razaq R. 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: Estimated Fetal Weights (CEFW) Versus Ultrasonographic Estimated Fetal Weight (UEFW). Ann Gulf Med. 2024 July 26;3(1). | DOI |

14. Alshoabi SA, Tarshun AM, Alnoman ZO, Aljohani FH, Alahmadi FM, Omer AM, et al. Investigating the Accuracy of Ultrasound Imaging in Measuring Fetal Weight in Comparison with the Actual Postpartum Weight. Pediatr Rep. 2025 Aug;17(4):70. | DOI |

15. Ero-Phillips AA, Jinadu FO, Ottun AT, Olumodeji AM. Sonographic estimation of foetal weight versus actual birth weight at term. Int J Reprod Contracept Obstet Gynecol. 2021 Apr 23;10(5):1782–7. | DOI |

16. Bora B, Das U. A comparative study of ultrasonographic birth weight with neonatal birth weight in a first referral unit of Guwahati. Int J Med Sci Public Health. 2015;4(9):1223. | DOI |

17. Sharma R, Bhoil R, Dogra P, Kaushal S, Sharma A. Accuracy and reliability of ultrasound estimation of fetal weight in women with a singleton term pregnancy. Int J Reprod Contracept Obstet Gynecol. 2020;9(1):323–7. | DOI |

18. Tuten N, Guralp O, Gok K, Tuten A, Gezer A. Factors Affecting Ultrasonographic Fetal Weight Estimation Accuracy in Low Birth Weight Newborns. Gynecol Obstet Reprod Med. 2022 Mar 30;28(1):23–30. | DOI |

19. Horky A, Wasenitz M, Iacovella C, Bahlmann F, Al Naimi A. The performance of sonographic antenatal birth weight assessment assisted with artificial intelligence compared to that of manual examiners at term. Arch Gynecol Obstet. 2025 Aug;312(2):487–93. | DOI |

20. Ricci AG, Brizot MD, Liao AW, Nomura RM, Zugaib M. Ultrasonographic accuracy of fetal weight estimation and influence of maternal and fetal factors. Revista Brasileira de Ginecologia e Obstetrícia. 2011;33:240-5. | DOI |