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Comparing Fetal Weight Estimates in the Third Trimester: Clinical Examination Findings, Ultrasonographic Estimation, and Actual Birth Weight

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Abstract

Objective: To determine the relationship between fetal weight on clinical and ultrasonographic examinations and actual birth weight during the third trimester of pregnancy.

Method: This descriptive cross-sectional study was conducted in Obs/Gynae from January 2023 to June 2023. A total of 1130 women between the ages of 18 and 40, gestational age of > 34 weeks, BMI of 18 to 25 kg/m^2, single cephalic fetus and who gave consent were included. The patients with PIH, preeclampsia, eclampsia, anaemia, chronic renal disease, diabetes and conditions such as polyhydramnios, oligohydramnios, and congenital fetal anomalies were excluded from the study. The demographic information was recorded. By using Johnson's formula, patients go through CEFW. The skilled radiologists performed an ultrasound on every female to obtain UEFW. The Shepard formula was used to calculate the FW. Following that, females were monitored till the birth of the fetus. The baby's actual birth weight (ABW) was recorded at birth. Pearson correlation was used to determine the relationship's correlation value between the ABW, CEFW, and UEFW. P values lower than 0.05 were regarded as significant.

Results: The patients' average age was 25.19±4.26 years. According to the gender breakdown of infants, 619 females (54.8%) and 511 males (45.2%) were born. 207 patients (18.3%) were primigravida and 923 patients (81.7%) were multiparous. The connection between CEFW and ABW was high (r=0.890; p 0.001), and UEFW and ABW were correlated with one other likewise (r=0.934; p 0.001). The following were the mean values of the various variables: Gestational age (weeks): 37.51±2.06; height (cm): 163.97±3.39; weight (kg): 76.43±6.65; BMI (kg/m^2): 28.60±2.80; SFH: 36.63±1.46; CEFW (gms) 3061.50±367.66, UEFW (gms) 3014.42±339.71 and ABW (gms) 3059.12±310.32.

Conclusion: According to the findings of our investigation, both clinical estimation and ultrasound estimation produced results that were both practicable and trustworthy. Both displayed a favourable link to the real birth weight.

Keywords: prenatal ultrasonography, fetal weight.

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1. Introduction

For managing labour and delivery, accurate calculation of the pelvic capacity of the mother, fetal weight (FW) and gestational age are crucial pieces of information.[1,2] The pregnant woman and the fetus may experience several serious issues as a result of an inaccurate assessment of the fetal weight.[3] Low birth weight (LBW) and high fetal weight (FW) at delivery are associated with an increased risk of newborn issues during labour and the puerperium.[4,5] The perinatal issues related to LBW can be attributed to preterm birth and intrauterine growth restriction (IUGR), and sometimes both. Extremely large fetuses run the danger of brachial plexus injury, bone fractures, shoulder dystocia, and intrapartum hypoxia after birth. Maternal risks associated with the delivery of an excessively large fetus include PPH, pelvic floor injuries, and birth canal injuries.[6]

The perinatal outcome can be significantly improved by accurately determining FW before birth. To estimate FW, measurements of the external abdomen may be utilized alone or in combination with fundal height measurement and/or a USG scan carried out approximately at 34 weeks. It is effective to identify intrauterine growth retardation using the estimation of FW by external abdominal measurements. It is advised to take action to make this technique easier to learn and more reproducible.[7] Additionally, it has recently been found that when estimating FW using USG, substantial mistakes can arise. It may be unnecessary to do an obstetrical intervention if the FW is simply determined by fetal ultrasonography. The USG results and the clinical evaluation must therefore be correlated.[8-10] Fetal weights are calculated using the

Johnson method, fundal height measurements, and the Insler-Bernstein formula when ultrasound technology is not accessible in the country. By using Leopold manoeuvres to palpate various fetal body sections on the abdomen, fetal weights can also be estimated. Simple clinical maternal measurements are used in both Johnson's method and Insler and Bernstein's formulae to calculate fetal weight.[11,12] The infant's ABW may be predicted by EFW using a measuring tape and two clinical formulae (Johnson's formula and Shepard formula) to within 10% of the mother's or ultrasound projections, according to a published study [16]. One study comparing CEFW and UEFW obtained the correlation coefficient between CEFW and UEFW as well as between UEFW and ABW. UEFW and ABW were significantly correlated (r=0.728) among infants delivered within the first week of estimation, although CEFW and ABW were not significantly correlated (r=0.074).[12,13] However, a different investigation discovered that the correlation coefficients for CEFW and UEFW were both statistically significant (p 0.001) and that CEFW and UEFW had correlation coefficients of 0.78 and 0.74, respectively. The authors concluded that CEFW and UEFW are both reliable enough to estimate FW.[13] According to one study, the CEFW and UEFW had relatively low coefficients of correlation (0.59 and 0.65, respectively).[13] This study aims to examine the link between fetal weight on clinical examination and ultrasonographic scans and actual birth weight throughout the third trimester of pregnancy. EFW throughout the third trimester may be beneficial for the health of both the mother and the newborn, according to published research.

The majority of methods for estimating the FW are also available, and some of them have demonstrated superior accuracy. However, the literature above also contains inconsistencies and flaws. We want to confirm the most accurate method for measuring FW through this study because, in our routine, we used a USG scan to estimate FW in the third trimester rather than relying on a clinical method. However, due to the busy OPD of the gynaecology department, it is difficult to get a USG on time because there is a long list of patients. We wanted to assess the clinical validity of FW to rely on it in the future and lessen the stress and usage of USG.

2. Materials & Methods

This descriptive cross-sectional study was conducted in Obs/Gynae from January 2023 to June 2023. The study was carried out over six months, from January 2023 to June 2023. Using 1130 cases, 5% type 1 error, 10% type II error, and the anticipated value of 0.74 for the correlation coefficient between CEFW and ABW in the third trimester of pregnancy, we calculated the necessary sample size. Purposive sampling with no probability was the method used.

The hospital's ethical review board granted permission for this study. Women who are between the ages of 18 and 40 and are pregnant at this time (gestational age of >34weeks) BMI of 18 to 25 kg/m^2 and a single cephalic fetus were included and those with, PIH, preeclampsia, eclampsia, anaemia, chronic renal disease, diabetes and condition polyhydramnios, oligohydramnios, and congenital fetal anomalies identified were excluded form study.

In the study, 1130 females from the OPD of the Obstetrics and Gynecology department at Obs/Gynae from January 2023 to June 2023 who met the eligibility requirements were enrolled. After obtaining written informed consent, each female's demographic information (name, age, BMI, and parity) was recorded. Then Johnson's formula was used to perform a clinical calculation of fetal weight. The skilled radiologists then performed UEFW.FW measurement was performed using the Shepard formula. ABW was recorded by a weight machine at birth.

SPSS 25.0 was used for data entry and analysis. Quantitative factors including age, gestational age, CEFW, UEFW, and ABW were provided as means with standard deviations. Quantitative variables like parity were reported in terms of frequency and percentage. The CEFW and UEFW correlation coefficient with ABW was calculated using Pearson correlation. The graphical representation of CEFW, UEFW, and ABW were compared using GraphPad Prism version 5. P value < 0.05 was considered statistically significant.

3. Results

1130 patients in total participated in this study. In terms of age distribution, 188 patients (16.6%) were between the ages of 31 and 40, while 942 patients (83.4%) fell between 18 and 30. The patients' average age was 25.19±4.26 years (Table 1). and 30. The patients' average age was 25.19±4.26 years (Table 1).

Table 1: Distribution of cases by age

Age (Year)	Number	Percentage
18-30	942	83.4
31-40	188	16.6
Total	**1130**	**100.0**
Mean±SD	**25.19±4.26**	

The gender distribution of newborns shows that 619 patients (54.8%) were female and 511 patients (45.2%) were male (Table 2).

Table 2: Distribution of cases by gender of baby

Gender	Number	Percentage
Male	511	45.2
Female	619	54.8
Total	**1130**	**100.0**

Among the 1130 patients, 207 (18.3%) were primigravida, and 923 (81.7%) were multigravida, (Table 3).

Table 3: Distribution of cases by parity

Parity	Number	Percentage
Primigravida	207	18.3%
Multigravida	923	81.7%
Total	**1130**	**100.0**

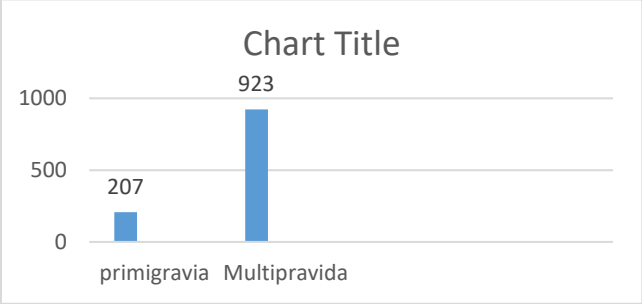

Figure 1: Shows the parity's frequency distribution.

There was a positive correlation between CEFW and ABW (r=0.890 with p-value <0.001) and the correlation between UEFW and ABW was also positive (r=0.934 with p-value <0.001) (Table-4).

Table 4: Correlations between CEFW and ABW UEFW and ABW

Variables		R	P value
CEFW ABW	**and**	0.890	p< 0.001
UEFW ABW	**and**	0.934	p<0.001

CEFW = Clinical estimated fetal weight
UEFW = Ultrasonographic estimated fetal weight
ABW = Actual birth weight

Mean values of different variables were as follows: Gestational age (week) 37.51±2.06, Height (cm) 163.97±3.39, Weight (Kg) c, BMI(kg/m^2) 28.60±2.80, SFH (cm) 36.63±1.46, CEFW (gms) 3061.50±367.66, UEFW (gms) 3014.42±339.71 and ABW (gms) 3059.12±310.32 (Table-5).

Table 5: Mean values of different variables

Variables	Mean	SD
Gestational age (week)	37.51	2.06
Height (cm)	163.97	3.39
Weight (Kg)	76.43	6.65
BMI	28.60	2.80
SFH	36.63	1.46
CEFW (gms)	3061.50	367.66
UEFW (gms)	3014.42	339.71
ABW (gms)	3059.12	310.32

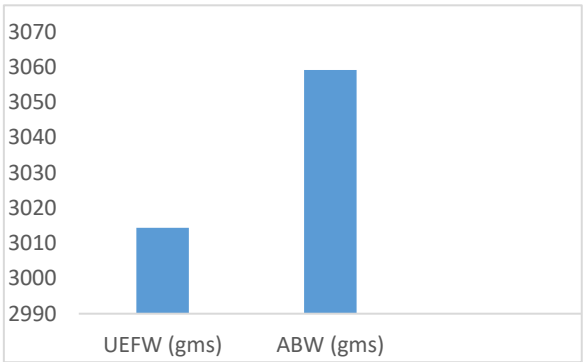

Figure 2: Graphical representation shows the comparison between UEFW and ABW

4. Discussion

The fundamental goal of prenatal care continues to be the detection and treatment of aberrant fetal growth, such as macrosomia and restriction of growth. The main part

of this screening involves a series of ultrasound examinations on a low-risk, unselected sample of individuals. A simple and convenient way to track the growth of fetal and look for intrauterine growth restriction (IUGR) is to estimate fetal weight.[12,13]

Accurate fetal weight assessment is essential for controlling labour and delivery, especially in high-risk pregnancies from the last 10 years. Healthcare professionals can monitor fetal growth, prepare suitable labour care, and make educated decisions about the mode of delivery by estimating the weight of the fetus. It enables them to foresee future issues and take the appropriate safety measures. It is important to note that estimating fetal weight is not an exact science, and there can be variations in the accuracy of different methods. Therefore, healthcare providers must consider various factors, including the mother's medical history, previous pregnancy outcomes, and the current pregnancy's specific circumstances, to make well-informed decisions regarding the control of labour and delivery management.[12]

In addition, counselling throughout pregnancy concerning the survival and some other steps like instances when a premature birth is predicted, the optimal way to birth the child, the degree of hospital care where the delivery should occur, or efforts taken to delay the preterm delivery may all or some of be based on the approximated anticipated birthweight. Synchronized obstetric procedures can result from the classification of the weight of the fetuses as little or large for gestational age, which together would constitute a significant departure from routine antenatal care.[13,14] In developing nations like Nigeria, the high number of infant deaths 39 to 130 live births per 1,000 continues to be a serious reason for worry[(14)]. Birth weight, which continues to be the single factor with the highest impact on newborn survival, is a crucial element in this issue.[14]

Both restricted intrauterine growth and macrosomia fetal increase the risk of long-term neurologic and developmental issues, as well as prenatal morbidity and mortality. After 37 weeks of gestation, the discovery of intrauterine growth restriction is a signal that the infant needs to be delivered to reduce the danger of fetal mortality. Similar to this, when macrosomia is diagnosed, caesarean sections are routinely used to deliver babies to lower the risk of unsuccessful vaginal deliveries and shoulder dystocia.[14,15]

Although SFH testing is an easy and inexpensive way to find abnormal fetal growth, a recent systematic review revealed that there is not enough data to evaluate its usage in routine prenatal care.[15] The mean SFH among the study participants was 26.32±3.58 cm. The significance of maternal and obstetric characteristics in predicting birth weight at term is confirmed, according to Alessandra Curt et al.'s study.[16] A skilled obstetrician's clinical estimation during labour is lower than the value of the variables determined by the statistical method.[16,17]

The management of labour and the care of the infant during the neonatal period heavily depends on an accurate calculation of the fetus' weight. It enables medical professionals to prepare for labour and delivery more effectively and foresee potential problems. There are some uses for precise fetal weight estimation, and labour management in which planning and controlling the delivery process can be done more efficiently by obstetricians and midwives when they are aware of the fetus's approximate weight. It helps in deciding when to induce labour or perform a cesarean section, especially if a large (macrocosmic) fetus is anticipated. The provision of prompt care and interventions for infants with specific requirements or difficulties is made possible by accurate fetal weight estimates by neonatal care teams. Due to fewer negative consequences for both mother and child, perinatal morbidity and mortality rates are decreased. While clinical models and ultrasound measures are useful, their accuracy cannot always be guaranteed. To monitor fetus health and ensure the best outcomes throughout labour and delivery, regular prenatal check-ups, ultrasounds, and appropriate medical treatment are essential.[17]

The results of our investigation demonstrated a positive correlation between estimates of the birth weight of fetal based on clinical and ultrasound data as well as the real birth weight. In our investigation, the patients' mean CEFW value was 3061.50±367.66 grams, had positive correlations with the ABW (r=0.890), and among the patients, the mean UEFW value was 3014.42±339.71 grams, also showed positive correlations with the ABW (r=0.934). In obstetrics, accurate fetal weight prediction has attracted a lot of attention. Fetal weight must be estimated from the mother's and the fetus's physical traits because it is impossible to measure it directly. To do this, several workers have employed a variety of techniques. The clinical and ultrasonographic procedures are the most often employed of the several techniques. Few studies have looked at the accuracy of fetal weight estimates made using clinical and ultrasonic

techniques.[17,18] Early third-trimester ultrasound fetal weight assessment may enable improved follow-up and birth preparation for both tiny and large gestational-age fetuses, according to NilgünGüdücü et al. However, fetal weight estimates obtained during the late third-trimester ultrasonography correlate more closely with the actual birth weight.[17]

Akinola S. Shittu and colleagues demonstrated in their study that the range of birthweights between 2,500<4,000 g and the low-birthweight group (<2,500 g) had the highest and lowest accuracy of clinical estimation, respectively. This is consistent with research by several researchers, who found that the clinical approach works ideal for predicting the reference birth-weight range of 2,500 g for the fetus.[18] In our study, the average birth weight was 76.43±6.65, while the average absolute weight difference was 3059.12±310.32 g range. A significant association between the ultrasound measurements and the postnatal measurements was also shown by Sanyal P et al. with a r value of 0.98.[18]

The correlation coefficient for ultrasound estimation was described by Akinola S et al. which is (0.74).[18] In their comparison of ultrasonic estimates, Uotila et al. found the correlation which was (0.77) Dare et al. likewise displayed a comparable proportion (0.74) and the correlation coefficient of clinical estimation was reported to be 0.78 by Akinola S et al. In our study, there was a strong association between CEFW and ABW (r=0.890; p 0.001), and there was also a strong link between UEFW and ABW which was favourable (r=0.934; p 0.001).

The precision of fetal weight assessment is a crucial point to remember which can vary based on several factors, and no method is entirely precise. However, studies like these help in understanding the degree of association between different estimation methods and actual birth weight, which can assist healthcare providers in making informed decisions during pregnancy and childbirth.

5. Conclusion

The current study's findings indicate that there is a strong positive link between UEFW and ABW as well as between CEFW and ABW. It is accurate and reliable to predict fetal weight using ultrasound, and it will be helpful in our environment. However, more research is required to increase fetal weight estimation accuracy, determine whether estimating fetal weight prediction close to delivery improves outcomes and assess how applicable these methods are to conditions that affect birth weight, such as premature membrane rupture and obesity, which were excluded from the present study.

INSTITUTIONAL REVIEW BOARD

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Contributions:

A.G, - Conception of study
- Experimentation/Study Conduction
S.A, H.A.A.K, S.A, T.F, A.R - Analysis/Interpretation/Discussion
A.G, A.R - Manuscript Writing
S.A, H.A.A.K, S.A, T.F - Critical Review
- Facilitation and Material analysis

All authors approved the final version to be published & agreed to be accountable for all aspects of the work.

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