OPEN ACCESS
Saudi Journal of Nursing and Health Care
Abbreviated Key Title: Saudi J Nurs Health Care
ISSN 2616-7921 (Print) | ISSN 2616-6186 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Fetal Anthropometry for Estimation of Fetal Weight between Weeks 20-40 of Development using Ultrasound in Ojo, Lagos State, Nigeria

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DOI: https://doi.org/10.36348/sjnhc.2026.v09i05.002 | **Received:** 14.12.2024 | **Accepted:** 17.01.2025 | **Published:** 02.05.2026

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Abstract

Determining the fetal weight accurately is essential for prenatal treatment and decision-making. The purpose of this study was to estimate the weight of the fetus in Ojo, Lagos State, Nigeria between 20 and 40 weeks of gestation by developing a fetal anthropometric model using ultrasound measures. A longitudinal study of 300 pregnant women was conducted, with obstetric ultrasound scans images. Fetal biometric parameters (abdominal circumference and femur length) were measured and correlated to estimate fetal weight using Hadlock's formula. A predictive model for fetal weight estimation was created using regression analysis. From the results, fetal biometric measurements are connected. When one goes up, the other goes down. This means that there is a relationship between fetal biometric measurements and estimated fetal weight (EFW). Hence, the size of a fetus can help us estimate how much it weighs. This shows that fetal measurements are helpful in predicting fetal weight.

Keywords: Fetal; Biometric; Determination; Ultrasound; Lagos State; Nigeria.

INTRODUCTION

The study of measuring the dimensions of bone, muscle, and adipose (fat) tissue in the human body is known as anthropometry [1]. Subcutaneous adipose tissue measurements are significant because high levels have been linked to elevated risks for cardiovascular disease, gallstones, arthritis, adult-onset diabetes mellitus, hypertension, and various cancers. This procedure comprises the methodical assessment of the human body's physical attributes, with an emphasis on measures that characterize body size and shape [2]. Given the limited efficacy of conventional techniques for determining living conditions, anthropometric history has emerged as a useful instrument for historians attempting to answer relevant questions.

A key component of contemporary prenatal treatment is fetal biometry, sometimes referred to as fetal anthropometry. Since the advent of ultrasonic fetal measures in the 1960s, biometry evaluation has been standard procedure [3]. Ultrasonography is used to measure several regions of the fetus in order to determine its growth, approximate weight, and overall health [4].

Further interpretations of fetal biometry depend on an accurate calculation of gestational age. More information about the causes of large or tiny fetuses and whether any anomalies are present can be obtained by fetal biometry [4-6]. It is among the most accurate and trustworthy methods for estimating a fetus's growth. The following fetal biometric measurements were utilized to determine these abnormalities: femoral diaphysis length (FL), head circumference (HC), abdominal circumference (AC), biparietal diameter (BPD), gestational sac, and crown rump length (CRL) (10). Nonetheless, BPD, HC, AC, and FL are the most often utilized fetal biometric markers. A simpler and more clinically relevant estimate of fetal weight can be used to incorporate these biometric measures into an estimated fetal weight (EFW).

There are numerous reasons why fetal biometric characteristics are significant. It helps pregnant women take preventative measures to lower their risk of developing high blood pressure by sending out notifications about the dangers of premature birth and pre-eclampsia. Additionally, it offers crucial details regarding growth restriction [7]. The purpose of this study was to ascertain the association and establish the correlation between estimated fetal weight and fetal biometric characteristics between gestational ages 20 and 40 weeks in Ojo, Lagos State, Nigeria.

MATERIALS AND METHODS

This study adopted a cross-sectional population based study design and consisted of 300 obstetric ultrasound scan images that belonged to pregnant women with single fetus within 20-40 weeks gestational age who visited Ceno Medical Laboratory Services, Ojo Local Government Area of Lagos State, Nigeria.

The following parameters were assessed:

Abdominal Circumference (AC): was determined by measuring the widest part of the fetal abdomen, specifically across the liver [8].

Femur length (FL): was determined by measuring the distance between the two blunt ends of the bone, running parallel to the shaft [9].

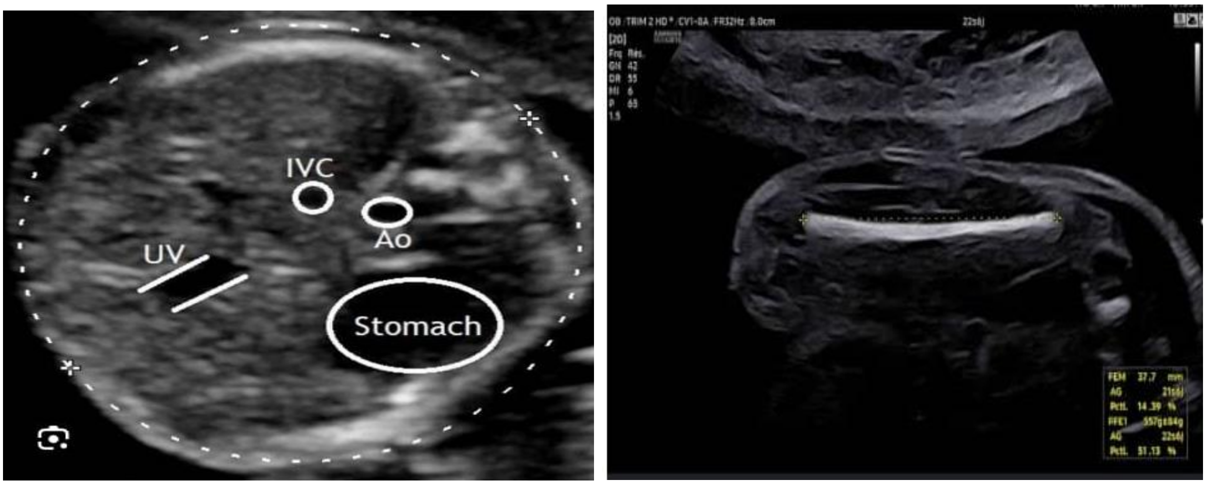

Figure 1 and 2: Measurement of Abdominal Circumference and Measurement of the Femur Length [9]

The Faculty of Basic Medical Sciences at Delta State University, Abraka's Research and Ethics Committee was consulted in order to obtain approval for the study (RBC/FBMC/DELSU/24/353). Additionally, Ceno Medical Laboratory Services, situated on Shibiri Road, Arola Bus Stop, Ojo, Lagos State, received approval from the Ethical Committee.

The gathered data from the research underwent both descriptive and inferential statistical analysis and the Hadlock's formula used in estimating fetal weight was outlined as follow:

Hadlock 3: Log 10 (Weight) = 1.326-0.00326*AC*FL+0.0107*HC +0.0438*AC + 0.158*FL.

RESULTS

Table 1 shows the descriptive statistics of all measured variables in the study population. The data provides an overview of the average values and variability of each variable within the dataset. For example, the average Femur Length (FL) was 56.36mm with a standard deviation of 11.13782, showing the typical measurement and range of femur length across the 300 cases.

The correlations among variables (FL and AC) are displayed in a correlation matrix in table 2 below. There is a strong positive correlation between FL and AC (0.994).

Table 3 shows the correlation between FL and AC. The P value of the linear regression equation shows there is a strong connection between fetal measurements (FL and AC) and the estimated weight of the fetus. This means we can use the fetal measurements such as the femur length and abdominal circumference to estimate its weight.

Table 1: Descriptive Statistics of the Biometric Parameters of Fetus

	Minimum (mm)	Maximum (mm)	Mean±SD
FL	31.60	73.30	56.36±11.13
AC	147.10	368.80	273.21±59.70
EFW	0.00	0.31	0.003±0.021

Key note:
FL-Femur Length, AC- Abdominal Circumference, EFW-Estimated Fetal Weight

Table 2: Correlations among Variables (FL and AC) with EFW

	FL	HC	BPD	AC	EFW
FL	1	.997**	.942**	.994**	-.280**
AC	.994**	.994**	.935**	1	-263**
EFW	-.280**	-.282**	-.280**	-.263**	1

Correlation is significant at the 0.01 level (2-tailed)

Table 3: Correlations between FL, AC and Measured Variable

Variables	R	P
FL	-0.280*	0.001
AC	-0.263*	0.001

FL-Femur Length, AC- Abdominal Circumference
r- Pearson's correlation coefficient
*Correlation is significant at the 0.05 level (2-tailed)

DISCUSSION

Over time, the estimated fetal weight has emerged as a crucial metric for tracking a fetus's growth. Fetal biometric measurements, including femur length (FL), and abdominal circumference (AC), have served as its foundation. According to the descriptive statistics of the biometric parameters in Table 1, which was a retrospective study, the femur length (FL) had a minimum value of 31.60 mm, which was less than the results of Hadlocks [10], who found that the FL had a standard value of 33 mm. Hadlock's [10] investigations had different minimum femur lengths of -1 mm and -1.40 mm, respectively. The maximum femur length of 73.30 mm was less than Hadlock [10] 77.00 mm. A slightly similarities therefore exist between the present and previous studies in comparison of the femur length.

The abdominal circumference from our study has a minimum value of 147.10 mm, which is smaller than the Hadlock [10] Standard value of 150 mm. The highest figure, 368.80mm, differs by 34.6mm from a previous study's 334.2mm and by 15.8mm from Hadlock's [10] Standard figure, which is 353mm.

This study suggests a connection between fetal biometric measures. Hence, when one rises, the other falls. This indicates that the estimated fetal weight (EFW) and the fetal biometric measurements (FL and AC) are related. Therefore, we can estimate a fetus's weight based on its size. This demonstrates that fetal weight may be predicted using prenatal measurements.

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