

**COMPARISON OF FETAL WEIGHT ESTIMATION BY CLINICAL METHODS (JOHNSON'S, DARE'S AND DAWN'S FORMULAS) VERSUS ULTRASONOGRAPHIC METHOD (HADLOCK) WITH ACTUAL BIRTH WEIGHT IN TERM PREGNANCIES AT TERTIARY CARE INSTITUTE.****Dr. Pooja Dagar**

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ABSTRACT

Objective: To compare and assess the accuracy of fetal weight estimation by clinical means (Johnson's, Dare's and Dawn's formulas) and ultrasonography by Hadlock's method, with actual birth weights at delivery. **Methods:** A prospective observational study was done on 500 term antenatal patients in Rajshree Medical College, Bareilly, from January 2024 to March 2025. Fetal weight estimations were done within 48 hours of labor by Johnson's formula, Dare's formula, Dawn's formula, and Hadlock's ultrasonographic method. They were compared with real birth weights noted at the time of birth. Correlation coefficients, mean absolute errors, and percentage errors were considered. **Results:** Hadlock's formula correlated most with real birth weight ($r = 0.91$), then Johnson's ($r = 0.82$), Dare's ($r = 0.67$) and Dawn's ($r = 0.60$). Mean absolute percentage error was smallest for Hadlock (7.1%), followed by Johnson (9.6%). For the weight range 2500–4000 g, Johnson's, Dare's, and Hadlock's formulas were of good accuracy; Hadlock and Johnson's formulas were comparable. Dawn's formula demonstrated the highest sensitivity in identifying macrosomic fetuses ($>4\text{kg}$) with 100% detection, though it overestimated weight in other categories. **Conclusion:** Ultrasonography is the most precise way of fetal weight estimation. However, Johnson's and Dawn's formula are valuable and cost-saving alternatives, especially in low-resource areas.

KEYWORDS :**INTRODUCTION**

Fetal weight estimation is the hub of obstetric decision-making. Fetal weight extremes, intrauterine growth restriction and macrosomia, are related to poor maternal and neonatal outcomes like shoulder dystocia, perinatal asphyxia, and augmented cesarean rates [1,2].

The most frequently employed techniques are clinical formulas and ultrasonographic measurements. Clinical techniques such as Johnson's and Dare's formulas are preferred in settings where resources are limited because of their simplicity and affordability [3,4]. Dawn's formula, though less commonly used, provides an anatomical perspective by factoring uterine diameters and has shown promise, particularly in identifying large fetuses. On the other hand, ultrasonography, particularly the Hadlock technique using fetal biometry, is used extensively in tertiary care facilities for its reliability and accuracy [5].

The objective of this research is to compare the predictive effectiveness of three clinical (Johnson's, Dare's, Dawn's) techniques against the Hadlock ultrasonographic method with true birth weight in a group of 500 women with singleton term pregnancies at Rajshree Medical College.

MATERIALS AND METHODS**Study Design:**

A prospective observational study conducted from January 2024 to March 2025.

Study Setting:

Department of Obstetrics and Gynecology, Rajshree Medical College, Bareilly.

Sample Size:

500 term pregnant women with singleton, cephalic pregnancies.

Inclusion Criteria:

- Gestational age ≥ 37 weeks.
- Confirmed dates by first-trimester ultrasound.
- Delivery within 48 hours of fetal weight estimation.

Exclusion Criteria:

- Polyhydramnios, oligohydramnios.
- Fetal anomalies or intrauterine demise.
- Multiple gestation.
- Maternal BMI $>35 \text{ kg/m}^2$.

Methods Of Fetal Weight Estimation:

1. Johnson's Formula:

Estimated Fetal Weight (g) = $(\text{SFH} - x) * 155$
where $x = 12$ if the fetal head is unengaged and 11 if engaged [3].

2. Dare's Formula:

Estimated Fetal Weight (g) = $\{\text{SFH}\} * \{\text{AG}\}$
where AG = abdominal girth in centimeters [4].

3. Dawn's Formula:

Estimated Fetal Weight (g) = $[\text{Longitudinal diameter} * (\text{Transverse diameter})^2 * 1.44] / 2$
Adjusted for DAWT $> 3\text{cm}$

4. Ultrasound Method:

Hadlock's formula uses biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC), and femur length (FL) to estimate fetal weight [5].

Data Collection:

Measurements were taken by a trained obstetrician. All participants delivered within 48 hours of estimation. Actual birth weight was recorded immediately after birth using a digital scale.

Statistical Analysis:

Data were analyzed using SPSS version 26. Pearson correlation coefficient (r), mean absolute error (MAE), mean absolute percentage error (MAPE), and intraclass correlation coefficient (ICC) were calculated. A p-value < 0.05 was considered statistically significant.

RESULTS**Demographics:**

- Mean maternal age: 25.6 ± 4.3 years.
- Mean gestational age: 38.3 ± 1.1 weeks.
- Primigravida: 42%; Multigravida: 58%.

Birth Weight Categories:

- $< 2500\text{g}$: 21.4% (107)
- 2500–4000g: 76% (380)
- 4000g: 2.6% (13)

Table 1: Correlation And Error Metrics Of Fetal Weight Estimation Methods

Method	Correlation (r)	MAE (g)	MAPE (%)
Johnson's	0.82	285	9.6
Dare's	0.67	339	11.3
Dawn's	0.60	395	13.7
Hadlock's	0.91	213	7.1

Explanation: Table 1 summarizes the correlation coefficient and error metrics. Hadlock's method had the strongest correlation and lowest error, while Dawn's method showed the least accuracy.

Table 2: Performance By Birth Weight Subgroups

Method	<2500g MAPE (%)	2500–4000g MAPE (%)	>4000g MAPE (%)
Johnson's	12.1	8.9	13.8
Dare's	14.8	9.2	15.6
Dawn's	15.2	12.5	4.3
Hadlock's	8.9	6.7	12.4

Explanation: Table 2 indicates that Hadlock's method performed best in low and average birth weight categories. Dawn's formula shows the lowest error in macrosomic fetuses

Table 3: Positive Predictive Value For Weight Categories

Method	<2500g	2500–4000g	>4000g
Johnson's	55.3%	86.6%	0%
Dare's	69.7%	90.4%	0%
Dawn's	69.7%	70.9%	100%
Hadlock's	69.7%	91.3%	66.7%

Explanation: Dawn's formula correctly identified all macrosomic babies in the study. Hadlock had excellent positive predictive value in average birth weight. Clinical methods, especially Dare's and Johnson's performed well for 2.5 KG to 4 KG group.

DISCUSSION

Estimating the fetal weight is crucial to minimizing delivery complications. Dawn's formula shows the highest positive predictive value in macrosomic fetuses. The ultrasound biometry-based Hadlock's formula had the lowest mean absolute percentage error and the strongest correlation in low and average birth weight babies. These results are consistent with earlier research by Veena et al. and Preyer et al. [2,5].

Johnson's formula confirmed findings from Kumari et al. and Ingale et al. [1,3] by predicting normal birth weights with comparable accuracy. Johnson's approach is appropriate for low-resource and rural environments due to its affordability and ease of use.

Despite being simple to use, Dare's formula showed the most variability, most likely as a result of the combined measurement errors of AG and SFH. This restriction aligns with previous findings by Aruna et al. [4].

Reliability issues at birth weight extremes were confirmed by the fact that none of the methods performed well in predicting macrosomia [6].

The use of clinical tools like the pelvimeter in dawn's method adds anatomical depth to the clinical estimation, offering an affordable alternative to detect outliers in fetal growth. Where sonographic access is restricted, clinical techniques—in particular, Johnson's—remain extremely valuable. These methods should be taught in training programs to enhance the provision of obstetric care.

CONCLUSION

Hadlock's ultrasonographic method stands out as the most precise way to estimate fetal weight. On the other hand, Jhonson's formula offers a solid alternative for estimating weights within the normal range, making it especially handy in situations where ultrasound isn't an option. Dawn's formula has better outcomes in macrosomic babies.

Recommendations

- Incorporate Johnson's formula in clinical training, especially in peripheral centers.
- Use ultrasonography preferentially in high-risk pregnancies and low birth weight suspicions.
- Larger multicentric studies are needed to evaluate demographic influences on formula performance.

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