



# **Validation of Vintzileos formula of adding fetal thigh circumference in prediction of fetal weight in comparison with other ultrasound methods**

Thesis

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## Summary

Accurate estimation of fetal weight in utero is a critical component of modern prenatal care, providing essential insights that guide obstetricians and midwives in making informed decisions about the timing and method of delivery. This process is crucial not only for planning the approach to vaginal birth after cesarean section (VBAC) and assisted breech deliveries but also for the early detection and management of potential complications such as intrauterine growth restriction (IUGR) and macrosomia. Given its profound implications on neonatal outcomes, fetal weight estimation has been identified as a key predictor of perinatal mortality, underscoring its importance in obstetric practice.

The literature delineates a variety of methods for fetal weight estimation, ranging from traditional clinical assessments to advanced ultrasonographic techniques. Among these, the use of obstetric ultrasound has emerged as the cornerstone, attributed to its superior accuracy over clinical methods that primarily rely on measurements such as fundal height.

Recent advancements have introduced the measurement of fetal thigh circumference (TC) as a promising sonographic parameter. This biometric marker not only estimates fetal birth weight with heightened precision but also aids in assessing changes in soft tissue mass, offering a comprehensive understanding of fetal growth.

The present study aimed to evaluate the integration of fetal thigh circumference (TC) into the Vintzileos formula for fetal weight estimation. This research will compare its effectiveness with established

methodologies, namely the Hadlock 3, Hadlock 4, and Shepard formulas, using postnatal fetal weight measurements as a benchmark for accuracy.

This study was designed as a prospective, observational investigation conducted within the Department of Obstetrics and Gynecology at Fayoum University Hospital. The investigation period initiated in January 2023, subsequent to receiving approval from the Scientific Research Ethics Committee of the Faculty of Medicine, Fayoum University.

A cohort of 160 pregnant women, embodying diverse gravidity and parity statuses at the time of delivery, was meticulously selected to partake in the study.

Utilizing 2-D transabdominal ultrasound scans performed between the 37th and 40th weeks of gestation, ideally a week preceding delivery, critical fetal measurements were obtained. These included the biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC), femur length (FL), and thigh circumference (TC). These dimensions were then applied in estimating fetal weights using Hadlock's, Shepard's, and Vintzileos et al.'s formulas. The estimated weights derived from these formulas were subsequently juxtaposed against the actual weights measured immediately following each neonate's resuscitation and stabilization.

The predictive accuracy of the sonographic formulae was evaluated by comparing the mean differences between the actual birth weight and the weights predicted by these formulae. Among them, the Vintzileos formula showed the highest mean difference, overestimating by 10.8%, whereas the Hadlock III formula demonstrated the least overestimation, at just 0.4%.

This comparison highlights the variability in accuracy among the different formulae used to estimate fetal weight.

Further, the study employed Pearson correlation analysis to assess the linear correlation between the predicted weights by the formulae and the actual birth weights, revealing a significant moderate to strong positive correlation across all studied formulae. Reliability analysis further corroborated these findings, with significant correlations between the formulae's estimated birth weights and actual birth weights (p-values <0.001). Cronbach's alpha values underscored the degree of correlation, with Hadlock III formula achieving the highest at 0.790, followed closely by Hadlock IV (0.785), Shepard (0.720), and Vintzileos (0.706).

Conclusively, the Hadlock III formula emerges as the most accurate for predicting fetal weight, as indicated by its lowest mean difference in overestimation (0.4%) when compared to actual birth weights. This formula also exhibited a high degree of reliability, with a Cronbach's alpha value of 0.790, the highest among the formulae evaluated