

Role of Fetal Thigh Circumference by Ultrasound in Estimation of Birth Weight

Thesis

Submitted for Partial Fulfillment of Master Degree
in Obstetrics and Gynecology

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2017



First of all, thanks to **Allah** for helping and guiding me in accomplishing this work and for everything else I have.

*Praise and gratitude is to **ALLAH** whom without his aid I would not have accomplished this work.*

*I am deeply grateful to **Prof. Dr. Magdy Mohamed Kamal**, Professor of Obstetrics and Gynecology, Faculty of Medicine, Ain Shams University, for his generous help and supervision.*

*I feel greatly indebted to **Dr. Kareem Mohamed Labib**, Lecturer of obstetrics and Gynecology, Faculty of Medicine, Ain Shams University, for his trustful help, sincere guidance and continuous support.*

*As I wish to express my deepest and ultimate gratitude to **Dr. Mohamed Kamal Etman**, Fellow of Obstetrics and Gynecology at Special Care Unit of Fetus El Demerdash Hospital, for his endless help providing me with all the encouragement, assistance and support.*

*My sincere thanks and appreciation go to **Dr. Ahmad Aboulfatth Mohammad Aly**, Specialist at the Ultrasound & Fetal Medicine Unit, Ain Shams University Maternity Hospital, for his continuous efforts, encouragement and great advice to complete this work.*

Finally I am very grateful to my beloved family, My Mother and Father, My Husband; I do owe you a lot.

Bisan Shaker

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List of Abbreviations

2D : Two-Dimensional

3D : Three-dimensional

AC..... : Abdominal circumference

AFI : Amniotic fluid index

AFV : Amniotic fluid volume

APAD..... : Anteroposterior abdominal diameter

BMI : Body mass index

BPD : Biparital diameter

BW : Birth weight

C.S..... : Cesarean section

CRF..... : Case record form

DM : Diabetes mellitus

EFW : Estimated fetal weight

FL : Femur length

FN..... : False negative

FP..... : False positive

GA..... : Gestational age

GHV : Growth hormone variant

HAPO : Hyperglycemia and adverse pregnancy outcome

HC : Head circumference

IGF-I..... : Insulin Growth factor 1

IUFD : Intra uterine fetal death

IUGR : Intra uterine growth restriction

LGA..... : Large for gestational age

LMP : Last menstrual period

MCV : Middle cerebral velocity

NPV..... : Negative predictive value

NVD..... : Normal vaginal delivery

OFD : Occipito-frontal diameter

PGH : Human Placental Growth Hormone

PI..... : Pulsatility index

PPV..... : Positive predictive value

PSV..... : Peak systolic velocity

SD..... : Standard deviation

SEM : Standard error of the mean

Sen : Sensitivity

SFH..... : Symfisio-fundal height

SGA..... : Small for gestational age

SPC..... : Specificity

TC..... : Thigh circumference

Thi-v..... : Thigh volume

TN..... : True negative

TP..... : True positive

Role of Fetal Thigh Circumference by Ultrasound in Estimation of Birth Weight

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Abstract

Objective: the aim of this work is assess the accuracy of measurements of fetal thigh circumference as a sonographic parameter in calculation of expected fetal weight.

Patients and methods: This is a cross-sectional diagnostic prospective study performed at Ain Shams University Maternity Hospital from October 2016 to May 2017, 228 pregnant women who met inclusion criteria and admitted for planned delivery at term (between 37-41 weeks) either be elective cesarean section or by induction of labour and vaginal delivery were subjected to history taking and ultrasound examination (fetal anatomy and fetal biometry: BPD, HC, FL, AC and TC) performed by an experienced sonographers using a Medison SonoAce R5 ultrasound machine. Counseling and verbal consent was taken before inclusion in the study. The estimated fetal weight (EFW) was be calculated by the formula of Hadlock et al based on BPD, HC, FL and AC and the formula of vintzileos et al based on BPD, AC, FL and TC. The newborns weighted after delivery within 24 hours and the actual birth weight compared to estimated fetal weight by ultrasound. Fetal weights are classified into low (<2500 gm), average (2500-4000) and macrosomia (>4000gm). Accuracy tested by correlating raw values of fetal weight by ultrasound (equations) with that of gold standard (postnatal weight). Different cut off points set for fetal weight to calculate different validation measures (sensitivity, specificity, PPV, NPV, likelihood ratio). P value, error value always set at 0.05, significant results declared if P value is less than 0.05. All data management performed using SPSS.

Results: The mean age of included women was 26.10 ± 4.84 years (range: 18 -40 years). The median parity was 1 (range: 0 - 5); the mean gestational age was 38.37 ± 1.18 weeks (range: 37 -41 weeks). Estimated fetal weight (EFW) using Hadlock's formula revealed that the number of neonates had low birth weight was 9 out of 228 (3.95%) while the number of neonates had average birth weight was 200 out of 228 (87.72%). On the other hand the number of neonates had macrosomia was 19 out of 228 (8.33%). Estimated fetal weight

(EFW) using Vintzileos' Formula revealed that the number of neonates had low birth weight was 11 out of 228 (4.8%) while the number of neonates had average birth weight was 204 out of 228 (89.5%). Moreover the number of neonates had macrosomia was 13 out of 228 (5.7%). Actual birth weight in the included women revealed that neonates had low birth weight was 11 out of 228 (4.8%), the number of neonates had average birth weight was 207 out of 228 (90.8%). Moreover the number of neonates had macrosomia was 10 out of 228 (4.4%). Correlation between Actual Birth Weight and Each of EFW (using Both Formulae) in included women revealed that there was a significant positive correlation between actual birth weight and each of EFW using Hadlock's formula and EFW using Vintzileos' formula. The higher correlation coefficient was with EFW using Vintzileos' formula [$r=0.907$, $p<0.001$], indicating more significant association. Significant positive correlation between actual fetal birth weight with both EFW using Hadlock's formula and EFW using Vintzileos' formula in all categories of birth weights (low, macrosomia and average), there was more significant positive correlation between actual fetal birth weight and EFW using Vintzileos' formula. Using Hadlock's formula, the mean error (from actual birth weight) was 221.58 ± 145.61 g. The mean absolute error percentage of the actual birth weight was 7.76 ± 3.72 . Of included women, 163 (71.5%) had their absolute error in Hadlock's formula-EFW within 10% of the actual birth weight, while 65 (28.5%) had it more than 10% of the actual birth weight. Using Vintzileos' formula, the mean error (from actual birth weight) was 57.73 ± 99.77 g. The mean absolute error percentage of the actual birth weight was 5.88 ± 4.69 . Of the included women, 176 (77.2%) had their absolute error in Vintzileos' formula-EFW within 10% of the actual weight, while 52 (22.8%) had it more than 10% of the actual birth weight.

Conclusion: It can be concluded that, based on this study thigh circumference has a role to play in accurately measuring fetal weight when incorporated with other fetal parameters. Vintzileos' formula in this study would be useful in daily clinical practice for estimation of fetal weight, and may prove most useful in predicting fetal weight when growth abnormalities are present. Good correlation was found between prenatal and postnatal thigh circumference estimates & ultrasound can fairly reproduce the actual thigh circumference and its inclusion in routine ultrasound is strongly recommended to improve the birth estimates.

Key Words: Fetal Thigh Circumference - Birth Weight - Ultrasound.