Assessment of Accuracy of two dimensions ultrasonography of fetal thigh soft tissue versus Hadlock's formula in estimation of fetal weight: Comparative study

Thesis

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بسم الله الرحمن الرحيم

قالوا

سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم الحكيم

صدق الله العظيم

سورة البقرة الآية: ٣٢

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✍ *Mohamed Abdel Aziz El Sayed El Zeiny*

List of Contents

Subject *Page No.*

List of Abbreviations

Abbr.	Full-term
AC..................	: Abdominal circumference
FL	: Femur length (FL)
BPD	: Biparietal diameter
HC	: Head circumference
GB..................	: Gigabyte
DVD...............	: Digital versatile disc
CRL...............	: Crown–rump length
SGA...............	: Small for gestational age
AGA	: Appropriate for gestational age
LGA...............	: Large for gestational age
TC **..................**	: Thoracic circumference
EFW..............	: Estimated fetal weight
ABW..............	: Actual birth weight

List of Tables

Table No.	Title	Page No.

List of Figures

Figure No.	Title	Page No.

Abstract

Objective:

The current study aims to compare between mid-thigh soft tissue formula and modified mid-thigh soft tissue formula with Hadlock formula in estimation of fetal weight.

Materials and methods:

Two hundred full term pregnant women attending Ain Shams Maternity Hospital in the period from April 2018 and April 2019 were included in this comparative study. Whole study group (200 women) had 2D ultrasonography using Hadlock's formula, thigh soft tissue formula and Modified thigh soft tissue formula.

Results:

In our current study Hadlock's formula was better than thigh soft tissue and modified thigh soft tissue formula in estimation of fetal weight.

Conclusions:

Fetal mid-thigh SST is a simple, useful, and easily applicable parameter for fetal weight estimation **.**

Keywords: Fetal weight estimation _ Mid-thigh soft tissue thickness

Introduction

The ultrasound estimation of fetal weight in term pregnancies is used to determine fetal growth, and this may affect the timing and route of delivery ***(Bamberg and Kalache, 2004, Conway, 2002).***

Although antenatal care has focused more on the diagnosis of fetal growth restriction and fetal macrosomia, the delivery of macrosomic infants is associated with higher rates of adverse outcomes for both mother and infant in comparison to the delivery of normal weight infants. Increased risks to the large infant include shoulder dystocia, brachial plexus injury, perinatal asphyxia, and neonatal death ***(Stotland et al., 2004)*** Adverse maternal outcomes include prolonged labour, genital tract trauma, postpartum haemorrhage, and a higher rate of caesarean delivery ***(Jolly et al., 2003).***

Macrosomia has variously been defined as birth weight >4000 g, >4500 g or >90^{th} centile for weight by gestation ***(Coomarasamy et al., 2005)*** one of the main causes of fetal macrosomia is maternal diabetes. Stotland NE et al 2004, ***(Abramowicz and Ahn, 2006)*** so ultrasound of fetal weight estimations is undertaken as part of the routine antenatal care of pregnant women, accurate estimation of fetal weight now has an important role in routine antenatal care and for detection of fetal growth abnormalities, for this reason, researchers have invested much effort in creating formulae that would accurately predict fetal weight. These formulae are mainly based on different combinations of sonographically measured fetal biometric indices, mainly abdominal circumference (AC), femur length (FL), biparietal diameter (BPD), and head circumference (HC).

Although some formulae include only 1 or 2 fetal indices, other models, in an effort to improve accuracy, incorporated either 3 or all 4 fetal indices.

Aim of the Work

The current study aims to compare between mid-thigh soft tissue formula and modified mid-thigh soft tissue formula with Hadlock formula in estimation of fetal weight.

Some Notes about the ultrasound

Introduction:

Ultrasound is an important tool in diagnosis and assessment of treatment in obstetrics and gynecology.

Sound is mechanical vibrations travelling in a physical medium such as air, water, metal or even human tissue. Whether the airborne vibrations come directly from the source or are reflected, they produce impressions on the eardrums of our vestibular organs.

Sound may be categorized according to various frequency levels:

- ***Infrasound*** (0–20 Hz)
- ***Audible sound*** (20–20 kHz)
- ***Ultrasound*** (>20 kHz)
- ***Diagnostic ultrasound*** (1–20 MHz)

Humans do not hear the infrasound but other species as whales, dolphins, elephants, hippopotamuses and rhinoceros do. The higher frequency limit for humans is 20 kHz. Frequencies above 20 kHz are called ultrasound. Some species may hear sound frequencies which for humans are categorized as ultrasound, for example mice (10–70 kHz), dogs (40–60 kHz) and bats (20–200 kHz) **(Watts, 2009).**

History of the Development of Ultrasound in Medicine:

After the *Titanic* ship hit an iceberg on its maiden trip in 1912, the Physicists took an interest in using sound to detect large objects submerged in water, initially their researches actually failed.

During World War I, the French physicist Paul Langevin was responsible for developing the hydrophones needed to detect submarines; this underwater sonar technology resulted in the first sinking of a German submarine in 1916. In 1917, Langevin invented the quartz sandwich transducer which served as the basis for the modern ultrasonic era. Between World War I and World War II, the development of sonar (Sound Navigation and Ranging System) and radar (Radio Detection and Ranging) took place. The latter technique used electromagnetic waves rather than ultrasound. The next important step was the use of ultrasound to detect flaws in metal using high frequency ultrasound. The metal flaw detectors became increasingly important as World War II was approaching, but were reported after the war, **(Desch et al., 1946, Firestone, 1946**).

After World War II, Howry and Bliss, in Denver, started to experiment with sonar equipment and amplifiers from the navy **(Howry and Bliss, 1952)**.

They developed a pulse-echo technique in 1948–49, and later produced cross-sectional images of a human partly