Thematic area: Infectious, non-communicable Disease and Nutrition

Sub-Thematic: Diagnostic Methods Development and Evolution

Jimma University, Collage of Public Health and Medical

Science, Department of Radiology.

MEGA PROJECT: Diagnostic Imaging methods, Development and

Evolution

PROJECT MEMBERS

Dr.BethlehemMezgebu(MD. Resident)…… Principal investigator

Dr .WondimGetnet(MD,Rdiologist)……..co investigator1

Mrs. BitiyaAdmassu (MPH, Assistant Professor of Reproductive Health)…co investigator2

Mr. MesfinZewdu(MSc. Medical Physics) ..... investigator

Dr. Elias Kedir (MD. Resident).....investigator

RESEARCH TOPIC: Correlation of Ultrasonographic Estimated Fetal Weight

and Actual Birth weight in Jimma University Specialized Hospital, Jimma,

South Western Ethiopia.CORRELATION OF ULTRASONOGRAPHIC ESTIMATED

FETAL WEIGHT AND ACTUAL BIRTHWEIGHT IN JIMMA

UNIVERSITY SPECIALIZED HOSPITAL, JIMMA, SOUTH

WESTERN ETHIOPIA.

BY; BETHLEHEM MEZGEBU (MD)

RADIOLOGY RESIDENT

RESEARCH PARER TO BE SUBMITTED TO JIMMA

UNIVERSITY, COLLEGE OF PUBLIC HEALTH AND

MEDICAL SCIENCES, DEPARTMENT OF RADIOLOGY IN

PARTIAL FULFILMENT OF THE REQUIREMENT OF

SPECIALITY CERTIFICATE IN RADIOLOGY.

MARCH, 2015 G.C

JIMMA, ETHIOPIACORRELATION OF ULTRASONOGRAPHIC ESTIMATED

FETAL WEIGHT AND ACTUAL BIRTHWEIGHT IN JIMMA

UNIVERSITY SPECIALIZED HOSPITAL, JIMMA, SOUTH

WESTERN ETHIOPIA.

BY; BETHLEHEM MEZGEBU (MD)

RADIOLOGY RESIDENT

ADVISORS

1. Dr.WONDIM GETNET (MD, Asssistant Professorof Radiology)

2. Mrs. BITIYA ADMASSU (MPH, Assistant Professor of Reproductive Health)

MARCH, 2015 G.C

JIMMA

ETHIOPIA

ABSTRACT

Obstetric sonographic assessment for the purpose of obtaining fetal biometric measurements to predict fetal weight has been integrated into the mainstream of obstetric practice during the past quarter century.

As such, the ultrasonographic technique represents the newest and most technologically sophisticated method of obtaining birth weight estimations. Though this method has been used for decades, a little is known about its validity in our country.

The objective of this study is to determine the correlation of ultrasonographic estimation of fetal weight and actual birth weight in Jimma University Specialized Hospital, from November 1- January 30, 2014 G.C

Facility based cross sectional study was conducted in Jimma university specialized hospital from November – January 2014. Convenient sampling technique was used for sample selection. All pregnant women who came during the study period and fulfill the inclusion criteria were included in the study. Ultrasonographic estimation of fetal weight was done by radiology resident whereas the birth weight was measured by midwife nurse within one hour of delivery. Checklist was used for data collection, Epidata for data entry and SPSS version 20 for data analysis. Descriptive analysis, correlation and specificity and sensitivity were determined. Ultrasound estimated fetal weight (EFW) was calculated by a preprogrammed Hadlock formula. The EFW was compared to the actual birth weight at delivery. The data is presented using tables, graphs and narrative.

Key words: ultrasonography, birth weight, Hadlock formula, Ethiopia.II

ACKNOWLEDGEMENTS

My deepest gratitude and sincere appreciation goes to Dr. Wondim Getnet and Mrs. Bitiya

Admassu for their support in providing materials and for their meticulous revision and correction of the paper.III

TABLE OF CONTENTS

Table of Contents

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

AC Abdominal Circumference

ABW Actual Birth Weight

AFI Amniotic Fluid Index

BPD Biparietal Diameter

C/S Cesarean Section

EFW Estimated Fetal Weight

ETB Ethiopian Birr

FL Femur Length

GA Gestational Age

GYN/OBS Gynecology & Obstetrics

HC Head Circumference

IUGR Intra Uterine Growth Retardation

JUSH Jimma University Specialized Hospital

LBW Low Birth Weight

SVD Spontaneous Vaginal DeliveryVII

1. INTRODUCTION

1. 1.BACKGROUND INFORMATION

Monitoring fetal growth is a standard component of antenatal care. Investigators have developed several equations for estimating fetal weight in the late second and the third trimester. These equations involve a variety of sonographically obtained biometric measurements. The fetal weight derived from these equations is then compared to distributions normalized for gestational age to identify growth outside the norm. Since abnormalities of fetal growth are associated with an increased risk of adverse outcome, this information often affects how the pregnancy and delivery will be managed (1). High rate of perinatal mortality (85 per 1,000 total births) is a major cause for concern in developing countries such as Ethiopia. A simple and accurate method of estimating intrauterine fetal weight that can be easily applied to all pregnancies is an important means of reducing perinatal mortality and morbidity through early detection of faltering growth(2).

From its inception, sonographic assessment method has been presumed to be more accurate than clinical methods for estimating fetal weight. The reasons for this assumption are varied, but the fundamental underlying presumption is that the sonographic measurements of multiple linear and planar dimensions of the fetus provide sufficient parametric information to allow for accurate algorithmic reconstruction of the 3-dimensional fetal volume of varying tissue density. Consistent with these beliefs, much effort has generated best-fit fetal biometric algorithms that can make birth weight predictions based on obstetric ultrasonographic measurements (3).

The two most popular formulas are Warsof's with Shepard's modification and Hadlock's. These formulas are included in most ultrasound equipment packages. However, at least

30 formulas for estimating fetal weight have been published (1).

Depending on many factors, the optimal range for birth weight is thought to be 2500-4000 grams.2

1.2. STATEMENT OF THE PROBLEM

Both low birth weight and excessive fetal weight at delivery are associated with an increased risk of newborn complications during labor and the puerperium (3).

The perinatal complications associated with low birth weight are attributable to either preterm delivery or intrauterine growth restriction, or both (3).

For excessively large fetuses, the potential complications associated with delivery include shoulder dystocia, brachial plexus injuries, bony injuries, and intrapartum asphyxia (4).

The maternal risks associated with the delivery of an excessively large fetus include birth canal and pelvic floor injuries, as well as postpartum hemorrhage (4).

The occurrence of cephalopelvic disproportion is more prevalent with increasing fetal size and contributes to both an increased rate of operative vaginal delivery and cesarean delivery for macrosomic fetuses compared with fetuses of normal weight (5).

Decreasing the potential complications associated with the birth of both small and excessively large fetuses requires accurate estimation of fetal weight in advance of delivery (5).3

2. LITRETURE REVIEW

2.1. Correlation Between Estimated And Actual Birth Weight

Accurate estimation of fetal weight has an important role in routine antenatal care and for detection of fetal abnormalities (6). For that reason researchers have created different regression models that would accurately predict fetal weight (6). These regression models are based on different combinations of sonographically measured fetal biometric indices, mainly abdominal circumference (AC), femoral length (FL), biparietal diameter (BPD), and head circumference (HC) (7).

Some of the models include only one or two fetal indices and other models, in an effort to improve accuracy, incorporate either three or all four fetal indices (Table 1) (6).

Abdominal Circumference is widely recognized and most useful dimension to evaluate fetal growth, although it is subject to larger inter-observer and intra-observer variability compared with linear measurements (7).

A wide variety of other diameters, circumference and (with the advent of the 3D sonography) volumes have been evaluated in the hope of improving the predictive value of established calculations. Most of these new formulas have yet not been clinically established.

Nevertheless, it remains unclear which of the many models available is the most accurate. The use of particular model is mainly based on preference of the individual obstetrician or radiologist (8).4

Birth weight is significantly associated with the child's mental and physical health. Low birth weight (<2500g) and extremely low birth weight (<1500g) are strongly correlated with neonatal morbidity, mortality and abnormal developmental outcomes, and needs urgent and efficient obstetrical and neonatal management. On the other hand macrocosmic babies (>4000g) have a six fold increased possibility of birth trauma and subsequent injury (9).

Knowledge of expected birth weight is attractive to clinicians as it is an important variable affecting perinatal mortality (10). It has tremendous value in obstetric and neonatal management in terms of appropriate time delivery, specific obstetrical interventions, and also for delivery under intensive neonate care support. It is also helpful in parents counseling for future consequences related to their new born. Fetal weight assessment is also an important part of antenatal care to assess fetal growth in the uterus for detecting intrauterine growth retardation (8).

In instances like diabetes in pregnancy, vaginal birth after a previous caesarean section, and intrapartum management of fetuses presenting by the breech, estimation of fetal weight will greatly influence their management (11).

High rate of perinatal mortality (85 per 1,000 total births) is still a major cause for concern in developing countries such as Ethiopia (2). A simple and accurate method of estimating intrauterine fetal weight that can be easily applied to all pregnancies is an important means of reducing perinatal mortality and morbidity through early detection of faltering growth (11).

Birth weight is one of the most important parameter that determines neonatal survival. Perinatal complications are always higher in too small as well as too large fetal weight at delivery. It is estimated that 13-15% of live born infants in sub-saharan Africa have low birth weight, a condition associated with high perinatal morbidity and mortality (12,13).

Fetal macrosomia is associated with high perinatal morbidity, shoulder dystosia, birth asphyxia, and birth trauma (14).5

Ultrasonographic image is currently considered sufficiently accurate for objective estimation of fetal weight and clinical applicability. It can serve to determine the weight of the fetus within 10% of actual birth weight. This degree of accuracy is dependent on actual fetal weight; there is a consistent tendency to either over estimate or under estimate EFW at the extremes of the fetal weight range. The limit in the accuracy is due to the fact that the mature fetus is an irregular, three dimensional structure of varying density, the weight of which cannot be calculated with certainty from biometric measurement (5). Improvements in ultrasound technology have not improved the accuracy of estimating fetal weight for extremes of weights. Estimating fetal weight in the very low birth weight infant is subject to much greater error than it is in large babies. Since clinicians are becoming increasingly reliant on imaging, caution should be taken while taking measures depending on sonographic weight measurement for extremes of weights (9).

The commonly used Hadlock formula will be used in our study since it has shown a better accuracy and lowest errors in estimating fetal weight in multiple studies(17,18). But this method is particularly poor when used with smaller babies; systematically underestimating the actual weight by 10-14% (SD 37-50%). It would be risky to make critical clinical decisions based on fetal weight alone with this degree of unreliability for very small babies (9).6

2.2. Factors Affecting Sonographic Fetal Weight Estimation

Although there are many data which show the importance of sonographic fetal weight estimation there is still one important question to be answered: What factors of influence have to be considered when assessing the precision of the fetal weight estimation? Several factors influence fetal weight, for example gestational age at delivery. It is estimated that fewer than 3% of births occur at precisely 40 weeks' gestation and because the standard deviation for term pregnancy is 2week, the normal range of term birth weight is typically referenced to the mean birth weight for pregnancies delivered at 38-42 weeks' gestation. During this four week interval, the typical fetus gain approximately 20g per day, on average. This is important because estimation of birth weight earlier in gestation can be used to monitor fetal growth. This is simple and direct indicator of fetal growth that is easy to use for doctors and easy to understand for patients (1).

The average birth weight during 38-42weeks varies substantially and depends on many factors, including maternal race, age, weight, parity, pregnancy, weight gain and hematocrit level (1).

Several technical limitations of the sonographic techniques for estimating fetal weight are well-known, including oligohydraminos, polyhydraminos and anterior placentation which potentially cause suboptimal visualization of fetal structure (1).

The time interval between sonographic estimation and delivery is also one of the most important factors. In one study which studied nine factors which influence sonographic fetal weight measurement, only the time interval was found to be significant (1).

Other disadvantages of ultrasonography are that it is both complicated and labor intensive, potentially being limited by suboptimal visualization of fetal structure. It also requires costly sonographic equipment and specially trained personnel (12,). Because of these sonographic methods are not readily accessible in under resourced settings (15).78

2.3. SIGNIFICANCE OF THE STUDY

Although worldwide there are many researches done regarding the correlation of sonographic fetal weight estimation with actual birth weight, there are only few done in Ethiopia and none in Jimma. Therefore this study will be used as a baseline for future studies.

There is no doubt that prenatal estimation of fetal weight will change the management of labor and postpartum fetal and maternal health outcomes especially in high risk pregnancies. So this research will help national policy makers and planners to improve the availability of ultrasound and trained personnel in healthcare providing institutions to increase the use of sonographic fetal weight measurement, hence improve maternal and child health.9

3. OBJECTIVES

3.1General objective

-To determine the specificity and sensitivity of sonographic fetal weight assessment in comparison with actual birth weight in Jimma University Specialized Hospital, Jimma, South Western Ethiopia.

3.2 Specific objectives

To determine the specificity of sonographic fetal weight measurement in Jimma University Specialized Hospital, Jimma, South Western Ethiopia.

To determine the sensitivity of sonographic fetal weight measurement in Jimma University Specialized Hospital, Jimma, South Western Ethiopia.

To identify factors which negatively influence sonographic fetal weight estimation in Jimma University Specialized Hospital, Jimma, South Western Ethiopia.10

4. METHODS AND SUBJECTS

4.1. Study setting and time frame

The study was conducted at Jimma University Specialized Hospital, Jimma. Jimma is located Southwest Ethiopia 355 km from the capital Addis Ababa. Jimma University Specialized Hospital (JUSH) is found in Jimma town, the capital of Jimma zone. It is the only specialized referral hospital in southwest Ethiopia.

The hospital gives service to about more than 15 million people living within wide catchment area in southwest Ethiopia.

The hospital has four major departments; Internal Medicine, Surgery, Gynecology/Obstetrics and Pediatrics, and five minor departments; Radiology, Ophthalmology, Dentistry, Dermatology and Psychiatry.

All sonographic fetal weight estimations were performed in the ultrasound unit of the department of Gyn/Obs.

The study was conducted from November 2014 to January 2015.

4.2. Study design

Facility based cross section study design was used.

4.3. Populations

4.3.1. Source population; pregnant women who came for delivery at JUSH

4.3.2. Study population; selected pregnant women who came for delivery at JUSH during the study period.

4.4. Inclusion and exclusion criteria

Inclusion criteria

-Only singleton pregnancies with term (37-42weeks) deliveries within 14days of the sonographic scan and with the actual birth weight of >1000g.11

Exclusion criteria

-Still born fetuses, obvious fetal anomalies that presumably would affect the biometry (e.g. Hydrocephalous), pregnancy related complications (e.g. preeclampsia, antepartum hemorrhage), ruptured membrane and poor visualization of fetal part were excluded.

- Women during and after the active stage of labor (cervical dilatation >4cm) were excluded.

4.5. Sample size determination and sampling technique

- Convienient sampling technique was used due to time and resource limitation.

-All pregnant women who came during the study period and who fulfil the inclusion criteria were included.

4.6. Study variable and measurement

Study variables:

Socio demographic and economic characteristics

Age, Residence, Marital status, Level of Education

Obstetrics characteristics

Medical history, Parity, , Gestational Age, Fetal Sex, Fetal Presentation, Placental Position, AFI, The Time gap Between EFW Measurement and Delivery, Mode of delivery.

Anthropometric measure

Actual Fetal Weight

Medical history

History of hypertension

History of diabetes

History of any other chronic medical illness

Dependent variable

Estimated fetal weight

Actual weight12

Measurements: Estimated fetal weight was measured using sonographic machine MODEL: Sonofine EUS B2 *086043DJby a preprogrammed Hadlock formula. It is a two dimensional ultrasound which uses an abdominal sector 3.5 MHz transducer.

-AFI was calculated by measuring the amniotic fluid pockets at the four quadrants.

- GA was calculated by the first day of last menstrual period or first trimester sonography when available.

-Actual fetal weight was measured by using digital scale.

4.7. Data collection methods

- Check list/ questionnaire were used to assess the socio-demographic and economic

characteristic of the mothers.

- Record review for medical history.

- Anthropometric measurements (actual weight of the baby)was measured by scale.

- Observation (placental position, fetal presentation, sex of fetus).

4.8. Data quality control

-Fetal weight was measured using sonographic machine MODEL: Sonofine EUS B2 *086043DJ by 3rd year radiology resident.

-Birth Weight was measured using digital weight scale. Two measurements were done by single person and if there is difference in the two measurements the average was taken.

-Scale was calibrated against known weight every day.

-Data collectors (midwife nurses) were trained by the Principal Investigator. They were trained on the objectives of the study, on proper checklist filling, on counseling and identifying eligible clients for the study purpose.

The principal investigator crosschecked the checklist to ensure proper filling of information.

-Supervision was made during data collection.13

4.9. Data analysis

Epidata was used for data entry and data analysis was made by SPSS version 20.

Data was explored to check for missing.

Frequency distribution, Sensitivity, specificity and correlation were calculated. Logistic regression was done to identify predictors of sonographic fetal weight estimation

4.10. Ethical consideration

-Permission letter was sought from the department of Radiology and Gyn/Obs.

-Ethical clearance was obtained from JU College of Public Health and Medical Science Research Ethics Committee.

-Participants were informed about objectives of the study and they will be assured of voluntary participation.

-Confidentiality was maintained throughout the study by ensuring that no names that would identify the participant.

-whenever any congenital fetal anomaly or pregnancy complications were detected during the sonographic fetal weight estimation, the findings were reported to responsible physician for detail investigation, diagnosis and management.14

4.11. Term definitions

Amniotic Fluid Index (AFI) =is assessment of the amount of amniotic fluid by measuring and adding the largest vertical pocket (single deepest pocket) in each of the four uterine quadrants. An AFI between 8-20cm is considered normal (17)

BirthWeight = is the first weight of the fetus or newborn obtained after birth (18).

Fetal Presentation =the presentation of a fetus about to be born refers to which anatomical part of the fetus is leading, that is, is closest to the pelvic inlet of the birth canal. According to the leading part, this is identified as a cephalic, breech, or shoulder presentation. (19)

Gestational Age = is a measure of the age of a pregnancy where the origin is the woman's last normal menstrual period (LMP), or by obstetric ultrasonography (20)

Low Birth Weight (LBW) = is defined as less than 2,500 g (up to and including 2,499 g) (18).

Macrosomia =is used to describe a newborn with an excessive birth weight (>4500 g or greater than 90% for gestational age after correcting for neonatal sex and ethnicity.(21)

Oligohydramnious = is the presence of inadequate amniotic fluid in the amniotic sac (AFI less than 8cm) (22)

Polyhydromnious= is a medical condition describing an excess of amniotic fluid in the amniotic sac (AFI greater than 20 cm) (22).15

Sensitive= Sensitivity relates to the test's ability to identify a condition correctly(23).

Specificity = Specificity relates to the test's ability to exclude a condition correctly (23).

Positive and Negative Predictive Value

The positive and negative predictive values (PPV and NPV respectively) are the proportions of positive and negative results in statistics and diagnostic tests that are true positive and true negative results. The PPV and NPV describe the performance of a diagnostic test or other statistical measure (23).1617

ANNEX

REFERENCES

1.Ivo Markus Heer , Carolin Kümpe, Nadin Vögtle ,Susanne Müller-Egloff ,Martin Dugas , Alexander Strauss. Analysis of Factors Influencing the Ultrasonic Fetal Weight Estimation. Fetal Diagn Ther 2008;23:204–210. (w w w.karger.com/fdt).

2.Getachew Bayou1 and YifruBerhan.Perinatal Mortality and Associated Risk Factors: A Case

Control Study.Ethiop J Health Sci. Nov 2012; 22(3): 153–162.

3.Ben-Haroush A1, Yogev Y, Bar J, Mashiach R, Kaplan B, Hod M, Meizner. Accuracy of sonographically estimated fetal weight in 840 women with different pregnancy complications prior to induction of labor.Perinatal Division and WHO Collaborating Center for Perinatal Care, Department of Obstetrics and Gynecology, Rabin Medical Center, Petah Tiqva, Israel. Ultrasound ObstetGynecol: 172-6.Feb; 23,2004.

4.Hassan M. Gaafar and Hala Abdel-Wahab.Prediction of Birth Weight Using Three-Dimensional Ultrasound Measurement of Fetal Thigh Volume. KAJOG; Kasr Al-Aini JournalOf Obstetrics & Gynecology. Vol. 3. Issue 1, April 2012. www.kajog.net.

5. MladenPredanic, MD, MSc, Angel Cho, MD and Flores Ingrid, MD, John Pellettieri, MD. Ultrasonographic Estimation of Fetal Weight.Acquiring Accuracy in Residency.The American Institute of Ultrasound in Medicine • J Ultrasound Med 21:495–500, 2002 • 0278-4297/02/

6. NirMelamed, MD, MSc, YarivYogev, MD, Israel Meizner, MD,ReuvenMashiach, MD, Ron Bardin, MD, Avi Ben-Haroush, MD.Sonographic Fetal Weight Estimation.Which Model Should Be Used?American Institute of Ultrasound in Medicine • J Ultrasound Med 2009; 28:617–629.

7.M. Scioscia, F. Scioscia, A. Vimercati, F. Caradonna, C. Nardelli, L. R. Pinto And L. E. Selvaggi.Estimation of fetal weight by measurement of fetal thigh soft-tissue thickness in the late third trimester.Ultrasound ObstetGynecol 2008; 31: 314–32, (www.interscience.wiley.com). DOI: 10.1002/uog.5253

8. WaseemAkhtar, Arif Ali, MubashirAslam, Farah Saeed, Salman and Nadeem Ahmad.Birth weight estimation.A sonographic model for Pakistani population.J Pak Med Assoc.Vol. 60, No. 7, July 2010.

9.N. G. Anderson, I. J. Jolley and J. E. Wells.Sonographic estimation of fetal weight: comparison of bias, precision and consistency using 12 different formulae.Ultrasound18 ObstetGynecol 2007; 30: 173–179. Published online 8 June 2007 in Wiley InterScience (www.interscience.wiley.com). DOI: 10.1002/uog.4037.Published by John Wiley & Sons, Ltd.

10. N. J. Dudley.A systematic review of the ultrasound estimation of fetal weight.Ultrasound ObstetGynecol 2005; 25: 80–89. Published online 26 October 2004 in Wiley InterScience (www.interscience.wiley.com). DOI: 10.1002/uog.175. Published by John Wiley & Sons, Ltd.

11. Colman Living.Validity of Ultrasound In Estimating Fetal Weight In Singleton Pregnancies At Muhimbili National Hospital.November 2012.

12.Akinola S. Shittu1, OluwafemiKuti, Ernest O. Orji,Niyi O. Makinde, Solomon O.

Ogunniyi,Oluwagbemiga O. Ayoola, and Salami S. Sule.Clinical versus Sonographic Estimation of Foetal Weight in Southwest Nigeria.J Health PopulNutr Mar 2007.

13. MW Pang,TK Lau and TN Leung, MD.A validation study of ultrasonic foetal weight estimation models for Hong Kong Chinese singleton pregnancies.Hong Kong Med J Vol 10 No 6 December 2004.

14. Avi Ben-Haroush, YarivYogev, Israel Meizner.Fetal Weight Estimation in Diabetic Pregnancies and Suspected Fetal Macrosomia: The Real Facts.Turkish Journal of Perinatology • Vol: 11, Number: 3-4/September-December 2003.

15. EO Ugwu, PC Udealor, CC Dim, SN Obi, BC Ozumba, DO Okeke, PU Agu.Accuracy of clinical and ultrasound estimation of fetal weight in predicting actual birth weight in Enugu, Southeastern Nigeria. Nigerian Journal of Clinical Practice.Vol 17, No 3. 2014.

16 .Tom C Winter; Sanders, Roger C. (2006).Clinical Sonography: A Practical Guide. Hagerstown, MD: Lippincott Williams & Wilkins. pp. p502.ISBN 0-7817-4869-0.

17 .Juozas Kurmanavicius, Tilo Burkhardt, Josef, Wisser and Renate Huch. Ultrasonographic fetal weight estimation: accuracy of formulas and accuracy of examiners by birth weight from 500 to 5000 g. J. Perinat. Med. 32 (2004) 155–161.

18.Bhandary Amritha A, Pinto Patric J, Shetty Ashwin P. comparative study of various methods of fetal weight estimation at term pregnancy. J Obstet Gynecol Ind Vol. 54, No.4: July/August 2004 pg 336-339.

19.Griffin M, Attilakos G, Greenwood R, Denbow M (2009). "Amniotic fluid index in low-risk, post-dates pregnancies".Fetal.Diagn.Ther. 26 (4): 212–5.

20.United Nations Children's Fund and World Health Organization; Low Birthweight: Country,19 regional and global estimates. UNICEF, New York, 2004.

21. Kish, Karen; Joseph V. Collea (2003). "Malpresentation& Cord Prolapse (Chapter 21)". In Alan H. DeCherney.Current Obstetric & Gynecologic Diagnosis & Treatment.Lauren Nathan (Ninth Edition ed.). Lange/McGraw-Hill.p. 369.ISBN 0-07-118207-1.

22. Obstetric Data Definitions Issues and Rationale for Change - Gestational Age & Term from Patient Safety and Quality Improvement at American Congress of Obstetricians and Gynecologists. November 2012.

23. AllahyarJazayeri, MD, PhD, FACOG, DACOG, FSMFM;Macrosomia.Medscape. Feb 14, 2012.

24 .Y Barnhard; I Bar-Hava; MY Divon.Is polyhydramnios in an ultrasonographically normal

fetus an indication for genetic evaluation?Obstet Gynecol. 1995 Nov;173(5):1523-7.

25.Fletcher, Robert H. Fletcher; Suzanne W. (2005). Clinical epidemiology : the essentials (4th ed. ed.). Baltimore, Md.: Lippincott Williams & Wilkins. p. 45. ISBN 0-7817-5215-9.20

QUESTIONNAIRE/ CHECK LIST

Jimma University College of public health & medical science student research program

A questionnaire designed to assess the correlation of ultrasonographic estimated fetal weight and actual birth weight in Jimma University Specialized Hospital, Jimma, South Western Ethiopia.

NB: when collecting data name of the respondent will be omitted for confidentiality & the data will never be used other than the intended purpose.

Part I. Sociodemographic information

Code---------- address ----------

1. Age in years_____

2. Marital status ;

Single____, Married ____ , Divorced ____, Widowed ____,

3. Educational status

a. No education b. read and write c. primary education d. secondary education

e. above secondary

Part II. Anthropometric measure

1. BMI_____

Part III. Medical history

1. Is there a history of hypertension? Yes_____, No_____

2. Is there a history of diabetes? Yes_____, No_____

3. Is there any history of other chronic illnesses Yes____, No_____21

Part IV. Questionnaire regarding current pregnancy

1. Parity _____

2. Gravida _____

3. GA_____ LMP_____, 1st trimester sonography____

4. Any history of ANC follows up for current pregnancy?

Yes____, No___

5. Any history of ultrasonographic fetal study for current pregnancy?

Yes___, No_____

Part V. Check list for fetal sonographic study

1. GA_____

2. Fetal Presentation_____

3. Placental Position_____

4. AFI_____

5. Fetal Weight(gm.)_____

6. Fetal Sex_____

Part VI. Check list for postpartum result

1. The Time gap Between EFW Measurement and Delivery(days)_____

2. Mode of delivery_____

SVD___, C/S_____, Instrumental _____

3. Actual weight(gm.)_____

4. Actual Sex_____

RESULTS

During the study period from the pregnant women who were admitted for elective delivery at JUSHa total of 210 met the inclusion criteria.

All of these women consented and underwent an ultrasound estimation of fetal weight.

The mean age was 24 years (SD ±4.5). Most were living a married life (98.1%)and did not have any formal education (93.3%).

Majority of the participants had parity of<2 (80.47%).

The median actual birth weight was 3100gm (range 2400-4000gm) and six neonates (2.9%) weighted less than 2500gm.

The majority of the participants (94.76%)deliver by spontaneous vaginal delivery (SVD). Eight of them delivered by caesarian section (C/S) and there were three instrumental deliveries.

Ninety eight percent (98%) of the participants had no history of any chronic illness. Four of the women had of hypertension and one woman had history of DM.

Majority had ANC follow up (87.6%) but only 35.7% of them had history of obstetric ultrasound examination at any point during the pregnancy and fromthis first trimester ultrasound was done foronly 11.4% of them.

Amniotic fluid index (AFI) was normal in 97.6% of them and polyhydramniosin three and oligohydramnios in two women.

Cephalic presentation was seen in 99% of them and only two of the fetus present breech.

Anterior placentation was seen in 60% of them and the remaining was posterior.Influencing Factors Definitions

Fetal gender M vs. F

AFI Normal vs. Other

Placental position Anterior vs. Posterior

Fetal presentation Cephalic vs. BreechTable 2.Distribution of participants by sociodemographic characteristics.

Sociodemographic characteristics No. (%)

Age

13-24 20%

25-34

35-44

Marital status

single 2(0.95%)

Married 206(98.10%)

Level of education

No formal education(Non- educated) 196(93.3%)

Read and write 6(2.86%)

Primary 2(0.95%)

secondary 4(1.9%)

Parity

O 96(45.7%)

1-2 73(23.3+11.43)

>3 18+9+4(-)Table 3.Correlation between estimated birth weight and actual birth weight

AFW EFW

AFW 1 0.946

EFW 0.946 1

P<0.001

There was a strong correlation between the two methods in the estimation of birth weight.

The association is statistically significant.Graph 1. Percentage distribution of actual birth weightTable

4.Percentage Distribution of EFW andABWIn Low Birth Weights.

Estimated fetal weight (gm.)

Actual birth

weight (gm.)

<2500 ≥ 2500 Total

<2500 3 (1.4%) 3 (1.4%) 6 (2.8%)

≥ 2500 0 (0%) 204(97.2%) 204(97.2%)

Total 3 (1.4%) 207(98.75%) 210(100%)

Fisher's Exact Test was done since three of the cells have a value of less than 5 (p<0.01).

This shows that the proportion ofLBW detected by the two methods is statistically significant.

The prevalence of neonates weighing below 2500gm is 2.85%.The sensitivity of ultrasound in estimation

of fetal weight <2500gm is 50% and specificityof

100%. The positive predictive value is 100% and the negative predictive value is 1.45%.

Graph 2. Sensitivity and specificity of sonographic fetal weight estimation in low birth weights.The sensitivity of ultrasound in estimation of fetal weight ≥ 2500gm is 100% but the specificity is 50%. Thepositive predictive value is 98.5% andnegative predictive value is 100%.

Graph 3.Sensitivity and specificity of sonographic fetal weight estimation in normal birth weights.Table 5.Factors of influence on the precision of the estimation

Factors of influence	Outcome β	p value
Fetal gender (M)	103.5	0.022
AFI - oligohydramnios		
- polyhydramnios	-269.6	0.251
	-152.9	0.426
Placental position (anterior)	-107.9	0.020
Fetal presentation (breech)	-13.9	0.953

The analysis of impact of factors on the accuracy of sonographic fetal weight estimation showed that male sex affects the accuracy positively with a p value of 0.02 and anterior placentation affects the accuracy negatively with a p value of 0.02.

The other factors did not show any significant influence on the sonographic estimation.DISCUSSION

In this study validity of ultrasound in estimating fetal weight in singleton pregnancies was determined. It is shown that there is strong correlation between sonographically measured and the actual birth weight.

The study shows that the positive predictive value and negative predictive value in diagnosing low birth weight were 100% and 1.45% respectively. It also shows that ultrasound has a positive predictive value and negative predictive value of 98.5% and 100% respectively for normal birth weight. Therefore ultrasound was found to be useful in diagnosing normal birth weight but less so in detecting low birth weight for the study setting.

The strong correlation (0.946) between direct birth weight and that estimated by ultrasound shows that, an increase or decrease in fetal weight has a direct effect in both methods.

The incidence of LBW in this study is 2.85%, but in other studies it is 13-15% in sub –Saharan Africa. This difference can be explained by the fact that the study included only singleton and term pregnancies, and excluded pregnancies with prenatal complications (pre-ecclampsia,

APH…). It is well known that the major causes of LBW are the above pregnancy related complications (8, 12).

The lower sensitivity and negative predictive value of ultrasound in estimating fetal weight found in this study can be explained by the fact that actual birth weight affects the estimation of fetal weight, i.e. when the ABW is within the LBW range the accuracy of the sonographic weight estimation will be low (12). This result is similar to the studies done previously (9). So it would be risky to make critical clinical decision based on fetal weight alone at an emergency setting for small babies. However since the specificity of the sonographic fetal weight estimation is very high. So this method can be used in planning of labour and delivery prior to labour. This will help to decrease the presumed complication of low birth weight babies at the antenatal period.

From all the studied factors which may affect the estimation of fetal weight only placental position and fetal sex found to be significant. Male sex affects the accuracy of estimation positively and anterior placentation affects the accuracy negatively. This finding is similar to the studies done in other countries (3, 15, 18).LIMITATION OF THE STUDY

Some of the limitations which were encountered during the study were: some pregnant mother could not remember there date of last menstruation and they had no an early ultrasound done so it was difficult to estimate the gestation age.

Since large babies (>4500g) were not encountered during the study period, the accuracy of sonographic weight measurement could not be determined in this group.CONCLUSION

Ultrasound is useful in diagnosing normal weight babies while its usefulness in detecting low birth weight birth babies is questionable even though the specificity is very high.

As the sensitivity of ultrasound estimation of fetal weight to detect small babies is poor, the use of such an objective measurement in the management of suspected low birth weight fetuses should be complemented by other clinical diagnostic methods.

RECOMMENDATIONS

As the study shows sonographic estimation of fetal weight is highly accurate in normal birth weight babies so it can be incorporated in the day to day management of labour and delivery.

Even though this study shows a low sensitivity of sonographic fetal weight estimation for low birth weight fetuses, it has showed high specificity. So, screening fetuses can safely be made to detect LBWs prior to labour & prepare the mother and the labour attendant for possible complications.

The researcher finally recommends that the national policy makers and planners to improve the availability of ultrasound and trained health personnel to decrease the maternal & neonatal complications associated with faulty fetal growth.