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COMPARATIVE STUDY OF BIRTH WEIGHT IN TERM PREGNANCY AND ITS CORRELATION WITH ESTIMATED FETAL WEIGHT CLINICALLY AND BY ULTRASONOGRAPHY.

Obstetrics & Gynaecology

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ABSTRACT

Objective: To compare and evaluate antenatally estimated fetal weight by using: 1. symphysiofundal height x abdominal girth (Dares formula) 2. Ultrasonography (Hadlock formula) with actual birth weight. **Materials and Methods:** A prospective comparative study was carried out at the Department of Obstetrics and Gynecology in Alluri Sitarama Raju Academy of Medical Sciences, Eluru from July 2019 to March 2020, to compare the accuracy of clinical and ultrasonographic estimation of fetal weight with actual birth weight at term. 100 pregnant women of term gestation who fulfilled the inclusion criteria had their fetal weight estimated independently using clinical and ultrasonographic methods. **Results:** About three fourth of the study subjects were in normal weight range of 2.5-4 Kg while 18% were LBW and 2% were VLBW babies. Both Dare's and Hadlock's formulae shows good correlation with actual birth weight across all weight ranges (r -0.983 and 0.985; $p<0.05$ for both) with best correlation observed at weight range of 2.5 to 3.5 Kg. Correlation was slightly lower at extremes of weight at both ends. In present study, on comparing prospectively clinical and sonographic methods of predicting birth weight antenatally at term, we found that clinical estimates appear to be as accurate as ultrasonographic ones. **Conclusion:** In developing countries where ultrasound is not available in many health care delivery system, clinical estimation of fetal weight is an easy, cost effective and simple method.

KEYWORDS

Dares, Fetal Birth Weight, Hadlock Formula, Pregnancy, Ultrasonography

INTRODUCTION:

Assessment of fetal weight is an important part of antenatal care and in the management of labor and delivery, decision making regarding instrumental vaginal delivery, trial of labor after caesarean section, management of macrosomia and low birth weight babies to prevent complications.

Birth weight of an infant is the single most important determinant of newborn survival. when dealing with anticipated preterm delivery, perinatal counselling on likelihood of survival, the intervention undertaken to postpone preterm delivery, optimal route of delivery, or the level of hospital where delivery should occur may be based wholly or in part on the estimation of expected birthweight. Categorization of foetal weight into either small or large for gestational age leads to timed obstetric interventions that collectively represent significant departure from routine antenatal care. High rate of perinatal mortality is still a major cause for concern in developing countries. A large portion of this problem is related to birthweight which remains the single most important parameter that determines neonatal survival.

Both low and excessive fetal weights at delivery are associated with an increased risk of newborn complications during labor and puerperium. It has been suggested that accurate estimation of fetal weight would help in successful management of labor and care of the newborn in the neonatal period and help avoidance of complications associated with fetal macrosomia, low birth weight babies, thereby decreasing perinatal morbidity and mortality.[2,3] The two main methods for predicting birthweight in current obstetrics are:

clinical techniques based on abdominal palpation of fetal parts (Leopold's maneuver) and calculations based on fundal height and abdominal girth sonographic measures of skeletal fetal parts.

Sonography is modern method with an advantage as it relies on linear and/or planar measurement of in-utero foetal dimensions that are definable objectively and should be reproducible.[5,6] Ultrasound estimation of fetal weight, while being accurate to a degree, is associated with error ranging from ±6 to 11% depending on parameters measured and the equation used for estimation. Although some investigators consider sonographic estimates to be superior to clinical estimates, others in comparing both techniques concurrently concluded that they confer similar level of accuracy.[7,8]

AIM OF STUDY:

The aim of this study was to estimate fetal weight by clinical method using Dares formula and by ultrasound using Hadlock's formula during antenatal period and then correlating both the methods with actual birth weight after delivery irrespective of route of delivery.

MATERIALS AND METHODS:

This prospective comparative study was carried out at the Obstetrics and Gynecology Department at Alluri Sitarama Raju Academy of Medical Sciences from July 2019 to March 2020. The study population included mothers with singleton term pregnancy in cephalic presentation, admitted either for normal vaginal delivery, elective caesarean section or induction of labor. 100 patients were included in the study after fulfilling the inclusion and exclusion criteria.

Eligibility Criteria:

Inclusion Criteria:

All patients with singleton viable pregnancy in cephalic presentation at term (>37wks). All patients coming in early labor and with intact membranes.

Exclusion Criteria

Fetal congenital anomalies.
Multiple pregnancies.
Rupture of membranes.
Malpresentation.
Patients with pelvic mass, fibroids.
Intra-uterine death.
Polyhydramnios / oligohydramnios.
Delivery after 1 week of estimation of weight

METHODOLOGY:

The fetal weight in-utero is estimated by following methods:
Clinical estimation of fetal weight by Dares formula.
Weight in grams = Abdominal Girth (centimeters)x Symphysiofundal Height (centimeters) (AGxSFH).
Abdominal girth was measured at the level of the umbilicus.
Symphysiofundal height was taken after correcting the dextrorotation, from the upper border of the symphysis to the height of the fundus.
Ultrasound estimation of fetal weight by Hadlock's formula.

After the Head Circumference (HC), Abdominal Circumference (AC)

and Femur Length (FL) of the fetus were measured in centimeters, the sonography machine calculating the fetal weight Estimated fetal weight(grams) LOG10=1.304+0.05281(AC) + 0.1938 (FL) - 0.004. (AC×FL)

Actual birth weight is obtained after delivery by a standard weighing scale.

RESULTS:

Table1: Distribution of subjects based on Age of Mother, Gestational age, Parity

Age of Mother (years)	No. of patients	Percentage%
20-25	63	63.0%
26-30	35	35.0%
31-35	2	2.0%
Gestation Age (weeks)		
37-38	38	38.0%
39-40	58	58.0%
>40	4	4.0%
Gravidity		
Primi-gravida	37	37.0%
2nd Gravida	42	42.0%
3rd Gravida	16	16.0%
4th Gravida	5	5.0%
Total	100	100.0%

Out of 100 patients examined, most of the study subjects were between 20-25 years of age (63%) with mean age of 24.52 years. Median period of gestation was 39 weeks with most of the females between 39-40 weeks of gestation (58%). Out of 100 patients, maximum number of patients were 2nd gravida at 42% followed by primigravida at 37%. (Table 1).

Table 2: Frequency distribution of sample data based on Actual Birth weight (kg)

Birth Weight (kg)	N	%
< 2.0	2	2%
2.0-2.5	18	18%
2.5-3.0	46	46%
3.0-3.5	27	27%
3.5-4.0	7	7%
Total	100	100%

Out of 100 patients examined, two patients delivered babies with actual birth weight less than 2 kg accounting for 2% of total. About 18 patients delivered babies with actual birth weight in the range of 2.0-2.5 kg accounting for 18% of the total. About 46 patients delivered babies with actual birth weight in the range of 2.5-3.0 kg accounting for 46% of total, 27patients delivered babies with actual birth weight in the range of 3.0-3.5 kg accounting 28% of total and. 7 patients delivered babies with actual birth weight in the range of 3.5-4.0 kg accounting 7% of total (Table 2).

Mean birth weight as predicted by Hadlock's and Dare's formulae was 2.93 and 2.87 kg respectively. The mean actual birth weight was 2.85 kg.This shows that USG based formulae predict the fetal weight on an upper side while clinical formula predicts it more accurately though slightly on higher side (Table 3).

The mean errors in predicting birth weight by Dare's and Hadlock's formulae were 62.1 and 99.7 as measured in grams respectively (Table 4).

The agreement as per weight category for Dare's formula was 94% as most of the babies (80 out of 85) predicted to be of normal weight range was in fact were between 2.5 to 4 kg at birth, five babies which were predicted to be weighing over 2.5 kg were below 2.5 kg. For rest of the discrepant measurements Dare's formula predicted the weight slightly on higher side. (Table 5) The agreement as per weight category for Hadlock's formulae was 96% as most of the babies (80 out of 83) predicted to be of normal weight range were in fact between 2.5 to 4 kg at birth, only three babies predicted to be weighing over 2.5 kg was below 2.5 kg. (Table 6)

Table 3. Distribution of subjects based on mean birth weight predicted by Hadlock's and Dare's formulae and Actual Mean Weight. (kg)

Birth Weight	Mean	Median	SD	Minimum	Maximum
Hadlock Formulae	2.93	2.91	0.40	1.93	3.88
Dare's Formulae	2.87	2.94	0.39	1.87	3.85
Actual Weight	2.85	2.88	0.42	1.93	3.96

Table 4. Distribution of subjects based on Mean deviation from actual birth weight as predicted by Hadlock and Dare's formulae

Deviation in Estimation of Birth Weight	Mean Deviation	Standard Deviation
Dare's (Kg)	0.062	0.39
Hadlock's (Kg)	0.099	0.40

Table 5: Comparison of Actual Birth weight and Weight predicted by Dare's formula

	Estimated Birth weight using Dare's Formula (in Kgs)						
Actual Birth Wt. (in Kgs)	< 2.0	2.0 - 2.5	2.5 - 3.0	3.0 - 3.5	3.5 - 4.0	> 4.0	Total
< 2.0	2	0	0	0	0	0	2
	100%	0%	0%	0%	0%	0%	
2.0 - 2.5	2	11	5	0	0	0	18
	11%	61%	28%	0%	0%	0%	
2.5 - 3.0	0	0	37	9	0	0	46
	0%	0%	80%	20%	0%	0%	
3.0 - 3.5	0	0	0	27	0	0	27
	0%	0%	0%	100%	0%	0%	
3.5 - 4.0	0	0	0	4	3	0	7
	0%	0%	0%	57%	43%	0%	
> 4.0	0	0	0	0	0	0	0
	0%	0%	0%	0%	0%	0%	
Total	4	11	42	40	3	0	100

Table 6: Comparison of Actual Birth weight vs Weight predicted by Hadlock's formula

	Estimated Birth weight using Hadlock's Formula (in Kgs)						
Actual Birth Wt. (in Kgs)	< 2.0	2.0 - 2.5	2.5 - 3.0	3.0 - 3.5	3.5 - 4.0	> 4.0	Total
< 2.0	2	0	0	0	0	0	2
	100%	0%	0%	0%	0%	0%	
2.0 - 2.5	0	15	3	0	0	0	18
	0%	83%	17%	0%	0%	0%	
2.5 - 3.0	0	0	36	10	0	0	46
	0%	0%	78%	22%	0%	0%	
3.0 - 3.5	0	0	0	27	0	0	27
	0%	0%	0%	100%	0%	0%	
3.5 - 4.0	0	0	0	0	7	0	7
	0%	0%	0%	0%	100%	0%	
> 4.0	0	0	0	0	0	0	0
	0%	0%	0%	0%	0%	0%	
Total	2	15	39	37	7	0	100

Both Dare's and Hadlock's formulae shows good correlation with actual birth weight across all weight ranges (r - 0.983 and 0.985; $p<0.05$ for both) with best correlation observed at weight range of 2.5 to 3.5 Kg. Correlation was slightly lower at extremes of weight at both ends (Table 5&6).

DISCUSSION:

Fetal weight estimation in routine practice is done by measuring the symphysiofundal height at each antenatal visit and then referral for sonographic estimation if it varies from the normal range for the gestation. It was expected that ultrasonography might provide a better standard for identifying fetuses of abnormal size for gestational age but prospective studies showed sonographic estimates of fetal weight to be

no better than clinical palpation for predicting fetal weight.9
Today, sonographic predictions are based on algorithms using various combinations of fetal parameters, such as Abdominal Circumference (AC), Femur Length (FL), Biparietal Diameter (BPD), and Head Circumference (HC) both singly and in combination. The above modern algorithms are generally comparable in terms of overall accuracy in predicting birth weight. When other sonographic fetal measurements are used for estimating fetal weight, e.g., humeral soft tissue thickness, ratio of subcutaneous tissue to femoral length, cheek-to-cheek distance, these non-standard measurements do not significantly improve the ability of obstetric sonography to help predict birth weight, except in special patients like mothers with diabetes.[10]

Several technical limitations of the sonographic technique for estimating fetal weight are well-known. Among these are maternal obesity, oligohydramnios, and anterior placentation. 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. Although such expensive imaging equipment is widely available in developed countries, this is generally not the case in developing nations like ours where medical resources are scarce.[11]

Clinically various calculations and formulae based on measuring uterine fundal height above symphysis pubis have been developed. Ojwang et al., used the product of symphysiofundal height and abdominal girth measurement at various levels in centimeters above the symphysis pubis in obtaining a fairly acceptable predictive value but with considerable variation from the mean. To further simplify this method, Dare et al., in Oauthc, Ile-Ife, in 1988, used the product of symphysiofundal height and abdominal girth at the level of the umbilicus measured in centimeters and result expressed in grams to estimate fetal weight at term in-utero, and the estimate correlated well with birthweight. Studies have shown that clinical Estimates of Fetal Weight (EFW) are at least as accurate as ultrasound late in the third trimester and intra partum.[13]

In the present study mean errors in predicting birth weight by Dare's and Hadlock's formulae were 62.1 and 99.7 as measured in grams respectively. This shows that USG based formula predict the fetal weight on a higher side while clinical formula predicts it more accurately.

CONCLUSION:

Clinical estimation of fetal weight is as accurate as the ultrasonographic method of estimation within the normal birth weight range. In a developing country like India, where ultrasound is not available in many health care delivery systems specially in peripheries at rural areas, clinical method is simple, easy, cost effective, accurate and can be used even by midwives.

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