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VALIDATION OF DARE'S FORMULA FOR ESTIMATION OF FETAL BIRTH WEIGHT IN TERM PREGNANCY

Gynecology

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ABSTRACT

Introduction: Prediction of Fetal Birth weight in utero is useful for the obstetrician in deciding whether or not to deliver the fetus and in deciding the mode of delivery.
Objectives: The aim of this study was to assess the fetal weight in term pregnancies by using Dare's formula and to compare it with actual weight of the baby after birth.
Methods: It is a prospective observational study of 227 women at term pregnancy at GMERS medical college & Hospital, sola , Ahmedabad from April 2014 to April 2016.
Result: This study showed that Dare's formula had positive correlation with Actual birth weight and is closely related to Actual birth weight.
Conclusion: Dare's formula is an inexpensive method for fetal growth measurement. It continues to be used in many countries on large scale because of its low cost, ease of use, and need for little training as the setup for ultrasonographic evaluation is not readily available in rural setups.

KEYWORDS

Fetal birth weight , Dare's formula, Birth weight estimation

INTRODUCTION

Accurate fetal birth weight estimation in term pregnancy and labour is useful in the management of labour and is an important indicator of pregnancy outcome. It allows obstetricians to make proper decisions about trial of labour after caesarean delivery and elective caesarean section for patients suspected of having a macrosomic fetus etc.[1-5]Both low birth weight and excessive birth weight at delivery are associated with increased risk of newborn complications during labour and puerperium.[6] Different methods of estimating fetal weight have been used and broadly they are classified as:

1. Clinical methods:

Extensively used, convenient and costless. Various clinical formulas like Johnson's formula, Dawn's formula and Dare's formula are used for fetal weight estimation.

2. Ultrasonography:

Several formulae have been developed for estimating fetal weight by ultrasound.[4,7-10] The most popular formulae are Shepard, Warsof's with Shepard's modification and Hadlock's. These formulae are included in most ultrasound equipment packages.

In rural setup imaging modality are not easily available and clinical methods are still used by health workers for birth weight estimation as clinical methods of birth weight estimation don't require any costly equipment and they are easy to use and give immediate estimation of expected birth weight.

MATERIALS & METHODS

The study was conducted in Obstetrics and Gynecology Department, GMERS Medical College Hospital Sola, AHMEDABAD. Antenatal patients with singleton live cephalic fetus with gestational age between 37 to 40 weeks attending Obstetrics and Gynecology Department of GMERS Medical College Hospital Sola, Ahmedabad were included over a period of 2 year from April 2014 to April 2016.

This was a prospective observational type of study.

The prevalence of full term antenatal patient in our institute was 30%. So with 90% confidence interval and 5% allowable error, the desired sample size was as follows

$$1N = p(1-p) \times z \div (me)^2$$

Where, N = sample size
p = prevalence 30%
z = confidential limit which is 90%=1.645
me = margin of error-5%

So,

$$N = 0.30(0.70)(1.645)^2 \div (0.05)^2$$

=227

Inclusion criteria:

1. Single live fetus
2. Gestational age between 37 to 40 weeks
3. Cephalic presentation

Exclusion criteria:

1. Multiple gestation
2. Malpresentation
3. Polyhydramnios
4. Oligohydramnios
5. IUGR
6. Fibroids or adnexal mass
7. Congenital anomalies

METHODOLOGY:

227 antenatal patients were included in our study as per inclusion criteria. All the eligible patients were given patient information sheet and were included in study after obtaining written informed consent.

The patient was then asked to empty her bladder and her symphysiofundal height (SFH) and abdominal girth (AG) were measured using a flexible, non-elastic, standard measure tape. Both measurements were performed with the patient lying flat on her back, with her legs extended. The SFH was measured from the midpoint of the upper border of the pubic symphysis to the highest point of the uterine fundus. For the AG measurement, the tape was repositioned to encircle the woman's waist, at the level of the umbilicus, without applying pressure to tighten the tape around the abdomen. These data were recorded on the individual data sheet and later used to calculate the fetal weight according following formula;
Dare's formula: Weight in grams = AG x SFH

Immediately after delivery birth weight estimation was done using a digital balance. If delivery did not occur within a week of estimations, the estimations were repeated and repeat estimations were taken in to consideration.

RESULTS

In our study the mean maternal age was 25.63±3.68 years and the median was 25 years (range 18–35 years). The mean parity was 0.89±0.82 and the median was 1 (range 0-3). The mean maternal BMI was 21.57±2.49kg/m^2 and the median was 21.51kg/m^2 (range 15.4kg/m^2-31.39kg/m^2). The mean gestational age at the time of delivery was 38.73±0.83weeks and the median was 38.6 weeks (range 37-40 weeks).

164(72.25%) cases were overestimated while 61(26.87%) cases were

underestimated. Mean error of over estimation and underestimation were 166.30gm and 101.33gm respectively. Maximum error in EBW estimated by method was 733gm. Estimations with error of <10% of ABW were 205 by using Dare's formula(90.31%).

Table 1: The mean fetal weight measured by Dare's formula

	N	Mean ±SD	Minimum	Maximum	Paired T test	P value
EBW by Dare's formula (gm)	227	2920±355	2100	4000	8.781	<0.0001
ABW (gm)	227	2827±365	2125	4120	-	-

The mean estimated birth weights (EBW) by Dare's formula was 2920±355gm. It was also found that actual birth weight was significantly different from clinically estimated weight but it was closely related to ABW. (T test = 8.781, P value <0.0001)

Table 2: The errors in Birth weight estimation by Dare's formula compared to actual birth weight

Error	Dare's Formula
Mean error (gm)	-92.92 ±159.43
Mean absolute error (gm)	147.37±110.78
Mean percentage error (%)	-3.510±5.688
Mean absolute percentage error (%)	5.298±4.067

Figure 1: Scatter diagram of Dare's fetal weight estimation and ABW

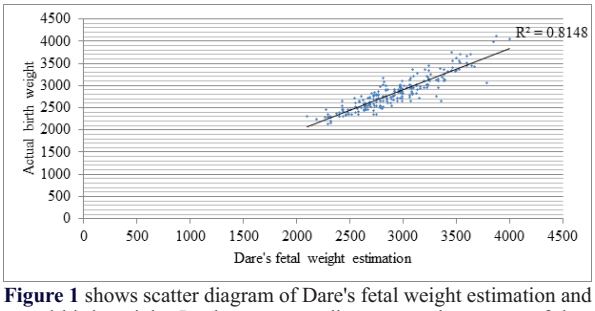

Figure 1 shows scatter diagram of Dare's fetal weight estimation and actual birth weight. In above scatter diagram, as the pattern of dots slopes from lower left to upper right and R^2 value is 0.8148, Dare's fetal weight estimation shows strong positive linear correlation with the actual birth weight.

DISCUSSION:

Charles Njoku et al[11] had found that the mean estimated birth weights (EBW) by Dare's formula was 3541±633gm in their study. They found that mean birth weight estimated by Dare's method was not statistically different from mean actual birth weight. (P value 0.695). In present study we found that the mean estimated birth weights (EBW) by Dare's formula was 2920±355gm. We found that mean birth weight estimated by this method was almost closer to mean actual birth weight but it was statistically different from mean actual birth weight. (P value was <0.0001). Tushar Raghuvanshi et al[12] had also found that mean of estimated fetal weight by Dare's formula (2696±394.2gm) was almost closer to the mean of actual birth weight (2593±427gm) but comparing it with ABW, difference was found statistically significant. (P value was 0.01).

Mean absolute error with Dare's formula was 362±307gm in Charles Njoku et al study while in this study it was 147.37±110.78 gm. Charles Njoku et al had found correlation coefficient of Dare's formula while comparing it with ABW was 0.740 while we found 0.902. Maximum error in estimated birth weight using Dare's formula were 734 gm and 1406 gm in studies conducted by Bhandary Amritha et al[13] and Tushar Raghuvanshi et al. In present study, maximum error was 733 gm. Accuracy of fetal estimates within 10% of ABW with Dare's method in various studies were Tushar Raghuvanshi et al (65%) and Charles Njoku et al (69.5%) while in present study it was 89.43%.

CONCLUSION:

Dare's formula is closely related to actual birth weight in our study and has positive linear correlation with ABW. As the actual birth weight increases the estimation of birth weight by Dare's formula also increases. If facility of USG is not available especially in low resource settings, the Dare's formula should be used for estimating birth weight as it helps us to predict maternal and perinatal outcome.

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- *Funding: None*
- *Conflict of interest: None declared*
- *Ethical approval: Approved by Institutional ethical committee, GMERS medical college sola, Ahmedabad.*

ABBREVIATIONS:

ABW : Actual Birth Weight
ANOVA : Analysis Of Variance
BMI : Body Mass Index
BW : Birth Weight
EBW : Estimated Birth Weight
GA : Gestational Age
SFH : Symphysio Fundal Height
SD : Standard Deviation
USG : Ultrasonography

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