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A Descriptive Study to Compare the Efficacy of Clinical Methods and Ultrasonography for Estimation of Foetal Weight in Term Pregnancy in the Department of Obstetrics and Gynecology, SMS Medical College, Jaipur

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Abstract
Background: *Birth weight of an infant is the single most important determinant of newborn survival & is a standard routine antepartum evaluation in high risk pregnancies. The present study was aim to estimate of fetal birth weight clinically and sonographically and compare them with actual birth weight after delivery of fetus.*
Material & Methods: *This is a descriptive type of observational study done on 100 full term pregnant woman who have been admitted in Department of Obstetric and Gynecology, SMS Medical College and Hospital, Jaipur (Raj.) from April 2017 onwards. All the examination was performed by a single person to avoid the bias. This measurement was recorded in the checklist and EFW were calculated by applying this information Johnson's formula & Hadlock formula.*
Results: *Our study showed that the majority of cases (60%) were seen in 21-25 years of age. The mean age of patients was 24.34 years. Majority of the birth weight were distributed between 3-3.5 kg, P value for both Hadlock formula and Johnson's formula were 0.5 i.e.>0.05 not significant. The mean birth weight of Johnson's formula is closest to the mean of actual birth weight. Average error is least between 2.5-3.0 kg in both the groups.*
Conclusion: *We regard the overestimation of foetal weight by the clinical method as a positive factor since it will enhance the sensitivity of health workers at peripheral centres if properly taught to them for earlier referral of mothers with macrosomic foetuses, thus contributing to reduction of obstructed labour and its sequelae.*
Keywords: *Birth weight, Hadlock formula, Johnson's formula, Fetal weight.*

Introduction

The accurate estimation of fetal weight (EFW) in relation to Gestational age is one of the key issues in the management of the labor and delivery in modern obstetrics.[1]

Birth weight of an infant is the single most important determinant of newborn survival & is a standard routine antepartum evaluation in high risk pregnancies. Both low birth weight and macrosomia are associated with an increase risk of new born complications during labor and puerperium.[2,3]

In preterm deliveries & Fetal growth restriction (FGR), high perinatal morbidity & mortality is attributed to Lower Birth Weight (LBW).[4]

On the other hand fetal macrosomia is associated with increased maternal morbidity, shoulder dystocia, birth asphyxia, birth injuries &PPH. Also management of VBAC, breech & GDM is guided by the EFW estimation. Thus precise FW estimation will help in successful management of labor & newborn & timely intervention will thus decrease the perinatal mobility & mortality.[4]

Also, 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 birth-weight. Categorization of foetal weight into either small or large for gestational age may lead to timed obstetric interventions that collectively represent significant departure from routine antenatal care.[5-7] A large portion of this problem is related to birth-weight which remains the single most important parameter that determines neonatal survival.[8-11]

It is estimated that 16% of liveborn infants have low birth-weight, a condition associated with high perinatal morbidity and mortality. Foetal macrosomia is associated with maternal morbidity, shoulder dystocia, birth asphyxia, and birth trauma.[11]

Associated with this is the question of its availability in resource poor settings. However, clinical methods have limitations of their own subject to inter individual variation depending on the experience of the observer in addition to errors inherent to the technique.

Therefore, there is a need to devise a method to accurately predict fetal weight which is widely available as well as reliable in order to achieve the best outcome.

In developing countries, ultrasonography may be unavailable or may not be affordable by patients. That is why measurement of fundal height using inexpensive and easily available nonelastic tapes has been recommended as a means of assessing birth weight in low-resource countries. The present study was aim to estimate of fetal birth weight clinically and sonographically and compare them with actual birth weight after delivery of fetus.

Material & Methods

This is a descriptive type of observational study done on 100 full term pregnant woman who have been admitted in Department of Obstetric and Gynecology, SMS Medical College and Hospital, Jaipur (Raj.) from April 2017 onwards.

Selection Criteria

Inclusion Criteria

Pregnant woman admitted for confinement in antenatal ward at term (≥37 weeks) giving written & informed consent.

Exclusion Criteria

1. Multiple pregnancy
2. Malpresentation
3. Fetal growth restriction
4. IUFD
5. Congenital anomalies
6. Poly or oligohydramnios
7. Fibroids or adenexal mass
8. Abnormal placentation
9. Medical disorders.

The selected patients were asked to empty their bladder and the symphysiofundal height (SFH) were measured from the upper border of pubic symphysis to the highest point of uterus with a flexible non elastic standard measuring tape and

abdominal circumference (AC) were measured at umblicus level without an excess pressure to tighten the tape.

All the examination was performed by a single person to avoid the bias. This measurement was recorded in the checklist and EFW were calculated by applying this information in the following studied formulas.

Johnson's Formula – Fetal weight in gram = 155x (Fundal Height –X)

X= 11 at plus station

=12 at zero station

= 13 at minus station

Ultrasonography Procedure

Apparatus used in the set-up for ultrasonography was real time ultrasound scan, equipment Philip HD 7 with a transducer frequency of 3.5Mhz Biparietal Diameter (BPD) was measured on the frozen image from the outer edge of the proximal skull to the inner edge of the distal skull table, with electronic calipers placed on a line perpendicular to mid line echo.

Head circumference (HC) was measured at the same section as above using ellipse method by tracing the head circumference along the outer skull table.

Abdominal circumference (AC) was measured at the level of umbilical vein as it enters liver. Stomach bubble was also taken as landmark. It was measured using ellipse method. Femur Length (FL) was measured from greater trochanter to external condyle, excluding femoral head.

Then standard tables stored in the equipment calculated the EDD. We also looked for cardiac activity, number of fetuses, congenital anomalies and placental localization and amniotic fluid index.

Hadlock formula

Log10EFW=1.3596-0.00386(ACXFL) + 0.0064 (HC) + 0.00061(BPDXAC) + 0.0425(AC) + 0.174(FL)

The actual birth weight of baby recorded within 5 minutes of delivery on a mechanical scale with accuracy of ± 50 gm and the actual weight of neonate were compared to ultrasound predicted birth weight and clinical predicted birth weight.

Ultrasonography- Fetal weight was estimated by hadlock`s formula taking biparital diameter (BP) abdominal circumference (AC) and femur length (FL).

Statistical analysis

Continuous variables were summarized as Mean and standard deviation, where as nominal/ categorical variables as proportion (%). Unpaired t test and other parametric test were used for analysis of continuous variables while chi square test/ fisher extract test and non-parametric test were used for categorical/ nominal variables. P value <0.05 were taken as significant.

Results

Our study showed that the majority of cases (60%) were seen in 21-25 years of age. The mean age of patients was 24.34 years (table 1). Majority of the birth weight were distributed between 3-3.5 kg, P value for both Hadlock formula and Johnson's formula were 0.5 i.e. >0.05 not significant (table 2). The mean birth weight of Johnson's formula is closest to the mean of actual birth weight (table 3). Average error is least between 2.5-3.0 kg in both the groups (table 4).

we can see that between 1.5-3.0 kg in both the formulae weight is overestimated and >3 kg weight is underestimated. In our study Johnson's formula is found better for SGA babies and average size babies where as hadlock is better for LGA babies. Hadlock underestimates the wt >3.5 kg (graph 1).

Table 1: Socio-demographic distribution of pregnant women

Demographic profile		No. of subjects	Percentage
Age	18-20 years	9	9%
	21-25 years	60	60%
	26-30 years	28	28%
	>30	3	3%
	Mean±SD	24.34±3.069	
Socio-economic status	Lower	40	40%
	Upper Middle	40	40%
	Lower middle	20	20%
Religion	Hindus	75	75%
	Muslims	25	25%

Table 2: Distribution of estimated birth weight and actual birth weight

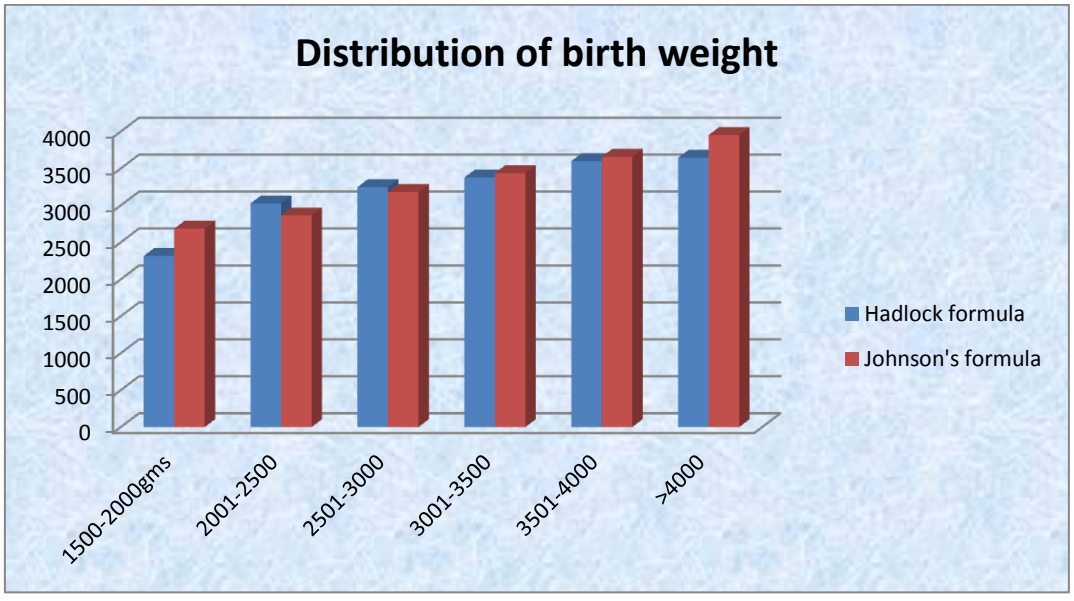
EFW in kg	Hadlock formula	%	Johnson's formula	%	Birth weight	%
1.5-2	-	-	-	-	3	3%
2-2.5	4	4%	4	4%	13	13%
2.5-3	20	20%	27	27%	41	41%
3-3.5	45	45%	37	37%	31	31%
3.5-4	31	31%	32	32%	12	12%

Table 3: Comparison of Mean weight of two formulae

	Mean birth weight in gms	S.D in gms
Hadlock formula	3274	389.3
Johnson's formula	3268	453
Birth weight	3007	488.3

Table 4: Average error in various fetal weight groups by different methods

Birth weight	Hadlock formula	Johnson's formula
<2000gm	107.1	55.08
2001-2500	71.37	110.9
2501-3000	54.14	53.41
3001-3500	59.85	82.69
3501-4000	76.52	70.08
>4000	347	232.5



Graph 1: Distribution of birth weight according to Hadlock and Johnson's formulae.

Discussion

Our study showed that the majority of cases (60%) were seen in 21-25 years of age and mean age of patients was 24.34 years. As it is the most fertile period more no of cases are seen. In the present study age group of subjects are comparable to Tiwari and sood[12], Bhandary et al[13] study. Age of the subject had no effect in estimating the fetal weight.

Our study showed that the primigravida was more common (75%) in pregnant women where as in Bhandary et al[13] study 45% were primigravida. Both gestational age and Parity does not affect the EFW.

The present study showed that the majority of patients (67%) had occurred in 37-39 gestational age of weeks. The mean gestational age was 38.89 wks. GA is comparable to Watchree et al[14] study.

Majority of the birth weight were distributed between 3-3.5 kg, P value for both Hadlock formula and Johnson's formula were 0.5 i.e. >0.05 not significant.

Raghuvanshi T et al (2014)[15] concluded that clinical estimation especially by SFH X AG method is as accurate as routine USG estimated in average birth weight. SFH X AG clinical formula can be of great value in developing countries like ours, where ultrasound is not available at many health care centers especially in a rural area. Haji EM et al (2016)[1] Found significant positive correlation was observed between actual birth weight and clinically estimated weight.

The mean error of Johnson formula is 261 gms which is in correlation with that of Watchree et al[14] and Bhandary et al[13] study. But in a study of Tiwari and Sood[12] mean error is more than that of our study.

The mean error of the Hadlock formula is 267 gms which is less than that of Bhandary et al and Ayoola et al[16] study.

In our study Johnson's formula is found better for SGA babies and average size babies where as hadlock is better for LGA babies. Hadlock underestimates the wt >3.5 kg. we can see that between 1.5-3.0 kg in both the formulae weight is overestimated and >3 kg weight is underestimated. Average error is least between 2.5-3.0 kg in both the groups. The studies by Hendrix *et al.* and Raman *et al.* showed that clinical estimation was significantly more accurate than sonographic prediction.[7,8] Similar results as obtained by Sharman *et al.*[16] and Titapant *et al.*[17] who observed that ultrasonic estimation was more accurate only when there is low birth-weight but in their own studies, both the methods underestimated birth-weight by more than 400g.

The role for ultrasonographic estimation appears that, when clinically estimated weight suggests weight less than <2,500 g, subsequent sonographic estimation would yield a better prediction and would be further necessary to assess such foetuses for congenital malformation and to do the biophysical profile to determine the well-being of the foetus.

Conclusion

We regard the overestimation of foetal weight by the clinical method as a positive factor since it will enhance the sensitivity of health workers at peripheral centres if properly taught to them for earlier referral of mothers with macrosomic foetuses, thus contributing to reduction of obstructed labour and its sequelae.

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