RESEARCH ARTICLE

Estimation of fetal actual weight with various methods in term pregnancy - a comparison.

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Manuscript Info

Abstract

Objective: To make a comparative evaluation of estimation of fetal weight in term pregnancy by using a) abdominal girth (AG) X symphysiofundal height (SFH) b) Hadlock's formula using ultrasonography c) Johnson's formula .

Methods: The fetal weight in-utero was calculated by using the above methods in 100 pregnant women at term. The results were correlated with the actual birth weight. Comparative analysis of the accuracy of the various methods was done.

Results: Average error in fetal weight estimation was least with AG X SFH method. Maximum error in fetal weight calculation was most marked with other formulas like Johnsons formula. 85.5% of cases came within 15% of birth weight by both AG X SFH method and Hadlock's formula using ultrasonography. Standard deviation of prediction error was least with Hadlock's ultrasound method, closely followed by AG X SFH method.

Conclusion: Though ultrasound predicts the fetal weight more accurately, AG X SFH which is also equally good should be used in day to day practice, especially in places where ultrasound is not available.

Introduction:-

Knowledge of the weight of the fetus in-utero is important for the obstetrician to decide whether to deliver or not to deliver the fetus and also to decide on the mode of delivery. Estimation of fetal weight is being done clinically, which has been criticized as less accurate because of observer variations. But Sherman etal, Baum etal and Titapantel all have found clinical estimation quite reliable. Ultrasound estimation of fetal weight using different formulas has gained much popularity. Various clinical formulas like Johnson's formula and Dawn's formula have come into usage for fetal weight estimation. Dareeta14 used the product of symphysio fundal height and abdominal girth measurements in centimeters in obtaining fairly predictable fetal weight estimation.

The aim of this study was to assess the fetal weight in term pregnancies by various methods-Abdominal Girth (centimeters) X symphysio fundal height (centimeters) (AGXSFH), Johnson's formula and Hadlock's formula using ultrasound, and to do the comparative evaluation of the methods after knowing the actual birth weight of the babies.

Material and Methods:-

One hundred women at term pregnancy were studied. The fetal weight w a s estimated within a week prior to delivery. If the delivery d i d not occur within a week of the estimations, the estimations were repeated and the sere peat estimations were taken into consideration. Cases of multiple gestation, mal presentation poly hydramnios or oligo hydramnios and fibroids oradnexal masses were excluded f r o m the study.

The study consisted of estimation of fetal weight using the following three methods.
1.   Weight in grams:-
Abdominal girth (centimeters) X symphysio fundal height (centimeters) (AG XSFH). Abdominal girth was measured at the level of the umbilicus. Symphysio fundal height or McDonald's measurement was taken, after correcting the dextro- rotation, from the upper border of the symphysis to the height of the fundus.

2.   Johnson's formula- Weight in grams: -
(Mcdonald's measurement of symphysio fundal height in centimeters -x) X155. Mcdonald's measurement was done as mentioned above. Station of the head was noted.

x= 13, when presenting part was not engaged.
x=12, when presenting part wasat 0 station.
x=11, when presenting part was at +1 station.

3.   Hadlock's formula using ultrasound- After head circumference (HC), abdominal circumference (AC) and femur length (FL) were measured in centimeters, the sonography machine calculated the fetal weight.

The fetal weights estimated by the above three methods were compared with the actual weight of the baby after birth. A comparative analysis of the three methods was done.

Results:-
Out of the 100 women studied, 45% were primigravida and 55% multigravidas. Seventy percent of the women had normal delivery, 19.5% had instrumental delivery and 10.5% had cesarean section. The cases were distributed as per the birth weight of the babies into five groups as shown in Table1.Maximum distribution of cases wasin2501- 3000 grams fetal weight group.

Table 1:-Distribution of the cases according to the birth weight

Sl. No	Groups	No. of Cases	Percentage
1.	< 2000 gms	7	7
2.	2001-2500 gms	23	23
3.	2501-3000 gms	54	54
4.	3001-3500 gms	15	15
5	>3500 gms	1	1
Total		**100**	**100**

Average error in various fetal weight groups by the four methods is given in Table II. The average error in all the weight groups except in the more than >3500 grams group was least with AG XSFH, closely followed by Hadlocksultrasound method. Average error in the above 3500grams group was least with Johnson's formula.

The number of under and over estimations in all the fetal weight groups for all the methods were calculated. AGXSFH method had tendency to under estimate the fetal weight. The other two methods overestimated the fetal weight. In the above3500 grams fetal weight group, all methods had a tendency to underestimate the fetal weight.

Maximum error in all fetal weight groups by the three methods is given in Table III. Maximum error was most marked with Hadlocks's formula and least with AGXSFH. Maximum error by AGXSFH was seen in 3001-3500 grams fetal weight group. In Johnson's formula it was seen in less than 2000grams fetal weight group and in Hadlock's method, it was seen in 2001-2500gram fetal weight group

Table 2: - Average error in various fetal weight groups by various methods

Method	Birth weights (in Gms)					
	< 2000	2001-2500	2501-3000	3001-3500	> 3500	All cases
	n=14	n=45	n=108	n=30	n = 3	n=100
	Average error (gms)					
AG X SFH	301.2	218.25	213.44	207	182	224.37
Johnson's	415.4	339.69	299.48	300	108	292.51
Hadlock's	362.57	256.2	217.42	219.37	440	299.11

Percentage error of the method was calculated using the formula -

Percentage error $= x/y \times 100$

x=error in grams

y=actual birth weight in grams

As seen in Table IV, 85.5% of cases came within 15% of birth weight by both AG XSFH and Hadlock's ultra sound method. As compared to that, only 63.5% came within 15 % of birth weight by Johnson's formula.

Table V compares the standard deviation of prediction error by all the methods. It was 258.4 grams by Hadlock's ultrasound method, closely followed by 272.66 gms by AGX SFH. It was much higher with Johnson's formula. The variance between the three methods was statistically significant ($p < 0.05$)

Table 3: - Maximum error in various fetal weight groups by various methods

Method	Birth weight					
	<2000 Gms	2001-2500 gms	2501-3000 gms	3001-500 gms	>3500 gms	All Cases n =200
Maximum error (gms)						
AGXSFH	530	584	610	734	213	534.2
Johnson's	1135	770	815	675	175	714
Hadlock's	702	774	653	634	474	647.4

Table 4: - Percentage error in the various methods

Percentage Error	AGXSFH method	Johnson's method	Hadlock's method
Up to 5%	33.5	17	27.5
Up to 10%	67	41	62
Up to 15%	85.5	63.5	85.5
Up to 20%	94	79.5	92.5
Up to 25%	96.5	89.5	96.5

Table-5:- Standard deviation of prediction error

Method	Standard Deviation (in gms)
AG X SFH	272.66
Johnson's	309.98
Hadlock's	258.48

Discussion:-

Equipped with information about the weight of the fetus, the obstetrician managing labor is able to pursue sound obstetric management decreasing perinatal morbidity and mortality. Symphysio fundal height is one of the important parameters taken for estimating fetal weight as in AFGXFSH method, Johnson's formula and the formula developed by Mhaskar etal. Dareeta1[4] found a percentage error between the actual and the estimated weight to be 20.1%, by AGXSFH method. In the present study, the average error in various fetal weight groups by AGXSFH was 224.37 gms which was least when compared to other methods, It was 299.11grams byHadlock's method and higher for the other methods (TableII). Tiwari and Sood[6] in their study showed an average error of 364.96 grams, 327.28 grams and 198.6 grams by applying clinical, Johnson's and Warsof's ultrasound method respectively.

In our study, average maximum error was the least by AGXSFH method followed by Hadlock's ultrasound method (Table III). In 85.5 % of the cases, percentage error was restricted to 15 % by AGXSFH and by Hadlock's ultra sound method, compared to 63.5% by Johnson's formula. Tiwari and Sood [6] found 92 % of cases within 15% of error by ultrasound method and 74% and 78% by clinical and Johnson's method respectively.

The standard deviation of prediction error was the least for Hadlock's ultrasound method, viz. 258.48 gms. It was 272.66 gms for AGXSFH and much higher for the Johnson's formula (Table V). Tiwari and Sood[6] recorded that standard deviation of prediction error was 462.11 gm, 338.75gms and 203.02 gms by using clinical, Johnson's and Warsof's ultrasound method respectively.

Hadlock's ultrasound method has the least standard deviation of prediction error in estimating the fetal weight. Of the three clinical formulas as studied, AGXSFH has better predictable results in fetal weight estimation compared to other two formulas. The AGX SFH clinical formula can be of great value in a developing country like ours, where ultrasound is not available at many health care delivery systems. It is easy and simple and can be used even by midwives.

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