IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 14, Issue 4 Ver. VII (Apr. 2015), PP 20-23
www.iosrjournals.org

Comparative Study Of Clinical Assessment Of Fetal Weight Estimation Using Johnson's Formula And Ultrasonographic Assessment Using Hadlock's Formula At Or Near Term

Dr.R.Sowjanya[1], Dr. S.Lavanya[2]
Assistant professor[1] , senior resident [2]
[1,2,](Dept of Obgyn, Siddhartha Medical College ,Vijayawada/DR NTR UHS, India)

Abstract: *The aim of the present study was to estimate fetal weight antenatally at or near term by using Johnson's formula and Hadlock's formula and comparing the two methods after knowing the actual birth weights of these babies after delivery and their accuracy compared. The study was a prospective study conducted on 100 pregnant women selected by simple random sampling who attended the antenatal clinic or were admitted in the antenatal ward at government general hospital ,Guntur. Fetal weight was estimated by using Johnson and R.W formula clinically and Hadlock'sformula ultrasonogrphically. All 100 women were delivered within one week of ultrasound examination and clinical estimation of fetal weight. Finally comparative analysis of fetal weight was made. Accuracy of both the methods was evaluated using the actual birth weight of baby after delivery. The birth weight estimated by Hadlock's formula by ultrasonography is more accurate than that estimated clinically by Johnson's formula. However the results of Johnson's method were comparable to results of Hadlock's.*

Keywords:*Birth weight, Johnson's formula, Hadlock's formula.*

I. Introduction

Present day obstetrics has in fact rightly been able to focus on the concept of fetal medicine as distinct and significant entity in view of rapid decline in maternal mortality and morbidity with simultaneous recognition of various forms of fetal handicaps affecting the overall perinatal mortality and morbidity. Growth is a basic fundamental of life. Assesment of fetal weight in utero leads to an improved prospective management of high risk pregnancies and considerable reduction in perinatal mortality and morbidity. It has become increasingly important especially for prevention of prematurity ,evaluation of fetopelvic disproportion , induction of labour before term and detection of IUGR. Thus a quick, easy and accurate method for estimating the fetal weight in utero with optimum precision would be of obvious benefit to the clinical practicing modern obstetricians. Estimation of birth weight by Johnson's formula based on symphysiofundal height has advantages of speed , economy and general applicability. Obstetric ultrasound has in fact revolutionized the knowledge of fetal medicine in the present day and can predict fetal weight with a great degree of precision. In our study birth weight was estimated using sonographic fetal growth parameters at or near term or in early labour by Hadlock's formula and clinically by Johnson's formula and correlated after birth with actual birth weight.

II. Materials and methods

The study was a prospective study conducted on 100 pregnant women selected by simple random sampling who attended the antenatal clinic or were admitted in the antenatal ward at government general hospital ,Guntur.

The selection of women was done by the following criteria :

i) All women at term
ii) All women delivered within one week of ultrasonography as well as measuring the fundal height
iii) Gestational age was known in all these patients by their LMP
iv) Women without any maternal complications and with cephalic presentation.

After an accurate clinical evaluation the following measurements were taken.

i) Symphysio fundal height was measured using a non elastic measuring tape with the patient in the supine position with legs semiflexed and bladder empty. The highest point of the fundus was marked by left index and middle finger at the fundus. With the help of a measuring tape marked in centimeters the distance from the upper border of the symphysis pubis to the fundus was taken with a tape lying in contact with the skin of the abdominal wall. The measurements were taken to the nearest 0.5 cms with tape reverse side up for the observer not to be influenced by the values. By careful examination the station of the vertex was determined. The fetal weight was estimated by using :

Johnson and R.W formula : (Symphysio fundal height in cm – n) x 155 gms.
n = 12 if vertex is ator above the level of ischial spines.
n = 11 if vertex is below the level of ischial spines.

ii) Fetal weight is estimated by ultrasonography by using :

Hadlock's formula: 10^ (1.335-(0.0034*AC * FL) + (0.0316*BPD) + (0.0457* AC) + (0.1623*FL).

The formula yields estimated fetal weight in gms when the BPD ,AC and FL are in centimeters.

The patients were followed until delivery . The date of delivery was noted. Baby was weighed within 2 hrs of the delivery and weight noted by spring balance (weighing machine). All 100 women were delivered within one week of ultrasound examination and clinical estimation of fetal weight.Finally comparative analysis of fetal weight was made.Accuracy of both the methods was evaluated using the actual birth weight of baby after delivery.

III. Results and observations

The sample comprised 100 pregnant women at or near term. Age of the sample ranged from 16-28 yrs with mean age of the sample being 20.4 yrs. Majority were multigravidae. Mean gestational age of the group was 38.14 weeks . All of them were delivered within one week of examination. Since the women chosen for this study were normal cases there were not many significant high risk factors. The only relative risk factor was in women with previous caesarean section. 13 were delivered by primary emergency caesarean section , 23 were delivered by repeat LSCS out of which 10 were delivered by repeat elective caesarean section, the indication being post caesarean section with CPD. 13 were delivered by repeat emergency LSCS , the indication being fetal distress. 100 cases under the present study were categorized into 4 groups with mean birth weight of babies under study being 2978.5 gms.

Table 1 : Distribution of cases into groups based on birth weight

Groups	Weight of babies in gms	No. of cases
I	2001-2500	16
II	2501-3000	48
III	3001-3500	34
IV	>3500	2

Table 2 : Average error in the fetal weight groups in gms by both the methods :

Method	Group I	Group II	Group III	Group IV	Average
Johnson	80	114	116	330	248
Hadlock	368	224	119	105	196

Average error was calculated by adding the error of estimation of fetal weight from actual birth weight in all cases and dividing it by total number of cases. These calculations were done for each method separately. Average error was least with Hadlock formula than Johnson formula. Average error in group I was more and group IV was less with hadlockformula and vice versa with Johnson formula.

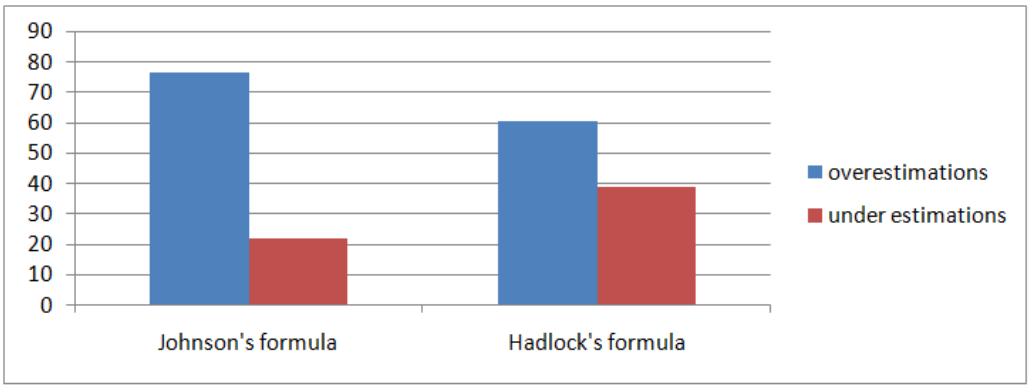
Table 3 : Maximum error in the fetal weight groups in gms by both the methods :

Method	Group I	Group II	Group III	Group IV	Average
Johnson	80	445	700	565	447.5
Hadlock	48	461	600	712	455

Maximum error was least in group I with both the methods . Maximum error was more in group III with Johnson formula. Maximum error was more in group IV with Hadlock formula. But average maximum error in both groups was comparable.

Table 4 : Number of over and under estimationby both the methods in various weight groups

Method	Group I		Group II		Group III		Group IV		total	
	over	under	over	under	over	under	over	under	over	under
Johnson	1	-	21	6	43	16	12	-	77	22
Hadlock	-	2	28	18	25	18	8	1	61	39



Johnson method over estimated the birth weight in all groups . Hadlock method also overestimated the birth weight in all groups except group I.

Table 5 : Percentage of cases with error in gms

Error in gms	Percentage of cases	
	Johnson method	Hadlock method
Upto 100	28	35
Upto 200	48	59
Upto 300	69	77
Upto 400	79	86
Upto 500	89	94

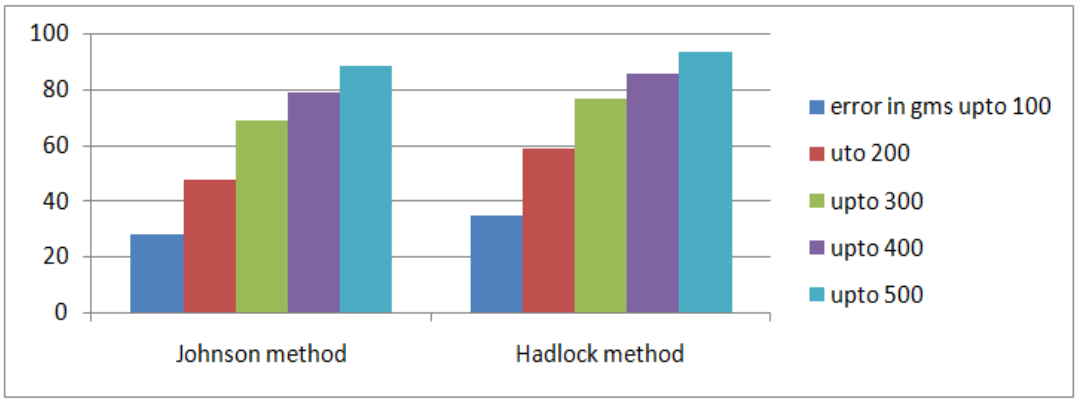


Table 6 : Percentage error per method

Percentage error	Johnson method	Hadlock method
Upto 5%	34%	48 %
Upto 10 %	67 %	77 %
Upto 15 %	86 %	88 %
Upto 20 %	93%	97 %
>20 %	100 %	100 %

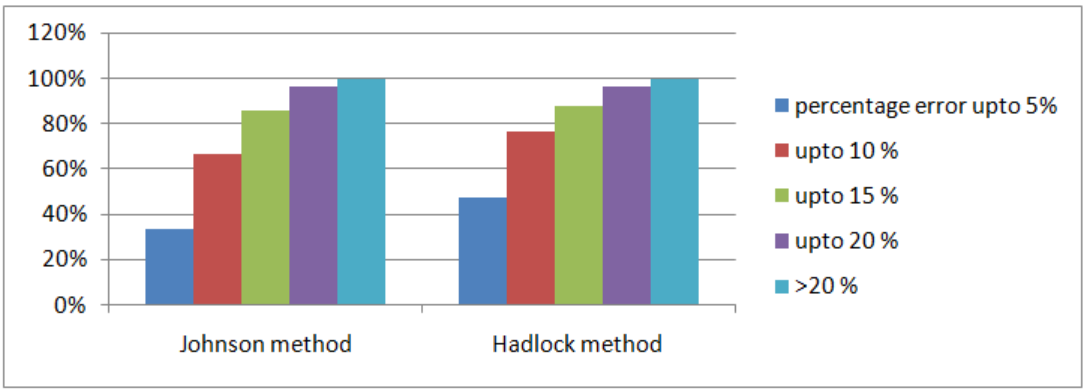


Table 7 : Standard deviation of prediction error and Standard error of mean.

method	Standard deviation	Standard error of mean
Johnsons	299.4	29.9
Hadlock	318.2	31.8

IV. Discussion

Fetal weight estimation has become increasingly important especially for the prevention of prematurity , evaluation of fetopelvic disproportion , decision for mode of delivery in breech presentation , induction of labour before term , in complications of pregnancy and in detection of intrauterine growth retardation . A lot of work has been done to find out the accurate methods for estimation of fetal size and weight in utero. The different works include clinical,biochemical,radiographic and ultrasonographic methods. Clinical methods were criticized on the basis of being less accurate and subject to considerable observer variation. Biochemical methods were not found to be satisfactory. Radiography was abandoned because of its hazards to both fetus and mother. Ultrasonography has gained popularity for determination of fetal parameters and wellbeing and also found to be useful for estimation of fetal weight. ($p< 0.05$).

There was a high correlation between actual weight and estimated weight by Johnsons method , correlation coefficient $r= 0.7019$, $p = < 0.001$, so it was statistically significant. However the estimated weight was on an average 0.171 kg higher than actual weight. The over estimation of weight by Johnson formula was statistically significant. Paired 't ' test $t = 7.02$ and $p = < 0.001$.

There was a high correlation between actual weight and estimated weight by Hadlock method , correlation coefficient $r= 0.7316$, $p = < 0.001$, so it was statistically significant. However the estimated weight was on an average 0.084 kg higher than actual weight. The over estimation of weight by Hadlock's formula was statistically significant. Paired 't ' test $t = 3.56$ and $p = < 0.001$.

The paired t test value between Johnsons and Hadlocks $t = 3.23$, $p = < 0.01$ and is statistically significant. The prediction of birth weight helps the obstetrician to decide the mode of delivery , anticipate problems during labour by electronic fetal monitoring in low birth weight infants ,anticipate possible shoulder dystocia in large for gestational age infants and hence arrange for help of senior obstetrician.

V. Conclusion

Antenatal fetal weight can be estimated with reasonable accuracy , clinically using Johnsons formula and ultrasound with Hadlocks formula . Hadlocks formula is more accurate than Johnson's formula. However the results of Johnson's were comparable to Hadlock's .Also ultrasound is not available in remote areas where as Johnson's formula is easy and simple to calculate and can be included in the M.C.H training programme of medical and paramedical staff and birth attendants.

References

[1]. Johnson R.W. : American journal of obstetrics and gynaecology, 76: 929,1957
[2]. Hadlock etal : sonographic estimation of fetal weight radiology 150 , 535-540 : 1984
[3]. Williams te xt book of obstetrics – 20 the edition
[4]. Frank P Hadlock etal sonographic estimation of fetal weight radiology 150 : 535-540 : 1984
[5]. Nelson text book of pediatrics 15 th edition
[6]. Practical guide to high risk pregnancy and delivery – Fernando arias -2 nd edition.