

A Study of Assessment of Fetal Weight in Term Pregnancy by Johnsons Formula and Comparison with Actual Birth Weight of Baby

Alka Patil*, Jasleen Mavi**, Shruti Singh***

Abstract

Introduction: Fetal birth weight is an important predictor of neonatal problems and an useful indicator of intrauterine environment indirectly reflecting the health of mother. Accurate estimation of fetal weight is vital in the management of labor and delivery.

Aims and Objectives: To study the assessment of fetal weight in term pregnancy by Johnson's formula and comparison with actual birth weight of baby.

Methodology: This was a Prospective Study carried out at medical college and hospital from January 2009 to October 2010 in the department of obstetrics and gynecology. Two hundred women at term were studied. The fetal weight was estimated at the time of admission by using Johnson's formula. The statistical analysis done by SPSS 17 version.

Result: The mean of baby's weight at birth was 2643 gms with 331.14 standard deviation on either side. Minimum value of Johnson's formula was below that of minimum 2000 actual weight of babies. Determined weight by Johnson's formula had mean error of 273 gms over that of actual weight. Johnson's formula had 11.3% mean error of birth weight. The Johnson's formula significantly differed from the actual birth weight ($P < .000$). In Johnson's formula error of more than 200gms had it in 68.5% babies. Johnson's

formula can determine 55.5% accurately birth weight with 15% error. In 74% babies birth weight was overestimated by Johnson formula; of them 56.5% babies weight was estimated above 200 gms. Birth weight was underestimated in 26% babies and 12% babies had weight determined less than 200gms of actual weight. Johnson's formula can predict accurately in 14% with 100gms difference.

Conclusion: From our study it can be concluded that Johnson's Formula is least accurate in predicting fetal birth weight, so other methods like USG and Symphysiofundal methods should be used to calculate the fetal birth weight.

Keywords: Fetal Birth Weight; Johnson's Formula; Symphysiofundal Height.

Introduction

Human fetal growth is characterized by sequential pattern of tissue and organ growth, differentiation and maturation. The fetal growth is complex involving biophysical and biochemical dimensions. In early fetal life the major determinant of growth is fetal genome but later in life pregnancy, environmental, nutritional and hormonal influences become increasingly important [1]. Fetal birth weight is an important predictor of neonatal problems and an useful indicator of intrauterine environment indirectly reflecting the health of mother [2]. Estimation of fetal weight is important for antenatal and intrapartum clinical decision making [3]. Estimated fetal weight has been incorporated into the standard routine antepartum evaluation of high-risk pregnancies and deliveries [4]. Sonographic estimates may not always be

*Professor and Head
***Sr. Resident, Dept. of
Obstetrics and Gynecology,
ACPM Medical College,
Dhule. **Gynaecologist,
Medical Officer, Panchkula
Haryana.

Alka Patil,
Professor and Head,
Dept. of Obstetrics and
Gynecology, ACPM
Medical College,
Sakri Road, Dhule - 424001
Maharashtra.
E-mail:
alkapatil@rediffmail.com

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available in low resource settings. In such instances it is essential to study the reliability of clinical estimation of fetal weight in assessing decision making [3].

Estimation of fetal weight in utero has been a fascinating and challenging task since almost a century. Estimation of fetal weight in utero helps the obstetrician in the prospective management of the high risk pregnancies, especially in deciding the timing and mode of delivery. Fetal macrosomia and intrauterine growth restriction has to be detected prenatally to reduce perinatal mortality and morbidity in term of long term neurological and developmental disorders. Accurate estimation of fetal weight helps the obstetrician in knowing the survival of neonate outside the uterus [1].

Prediction of fetal weight has been a subject which has interested many workers. It is useful for the prevention of prematurity by avoiding delivery of small babies through induction or caesarean section. It also helps in evaluation of fetopelvic disproportion, decision for mode of delivery in breech presentation and in complications of pregnancy. It can also prove to be valuable in detection of intrauterine growth retardation. Much work has been done to find out accurate methods for estimation of fetal weight and size in utero. However, estimation of fetal weight by clinical methods still has an important place in a developing country like India where ultrasound is not universally available and only comparable accuracy with sonography has been reported. The proper clinical management of pregnancy and delivery is greatly influenced by information regarding fetal weight [5-8].

There is no doubt about the necessity and the importance of estimating fetal weight in utero. Alterations in intrauterine growth, both retardation and acceleration contribute significantly to perinatal morbidity and mortality [9]. Accurate antenatal diagnoses of altered fetal growth enables the obstetrician to evaluate and manage these problems more effectively.

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 [5]. Estimation of fetal weight is being done clinically, which has been criticized as less accurate because of observer variations. But

Results

Table 1: Showing distribution of actual birth weight and predicted birth weight by Johnson's formula

Methods	Mean	Std deviation	Minimum	maximum
Actual birth weight(Grams)	2643.00	331.14	2000	3615
Johnson's formula(Grams)	2916.81	487.09	1240	4030

Sherman *et al* [10], Baum JD, Gussman D, Wirth JC 3rd [11] and Titapant V, Chawanpaiboon S. Mingmitpatanakul K [12] have found clinical estimation quite reliable. Dare *et al* [13] used the product of symphysiofundal height, abdominal girth in centimeters in obtaining fairly predictable fetal weight estimation. Furthermore, a precise estimation of fetal weight can be helpful in study of fetal dynamics, especially the fetal blood flow which is correlated to the birth weight [14].

Any method that accurately estimates fetal weight is obviously of benefit to the practicing clinician. The estimation of fetal weight via palpation of the uterine fundus is known to be notoriously inaccurate, especially at the upper and lower ends of the weight spectrum. Birth weight depends on many factors, including maternal size, disease, smoking habits, parental race, and constitutional and sociodemographic characteristics.

Aims and Objectives

To Study the assessment of fetal weight in term pregnancy by Johnson's formula and comparison with actual birth weight of baby.

Methodology

This was a Prospective Study carried out at medical college and hospital from January 2009 to October 2010 in the department of obstetrics and gynecology. Two hundred women at term were studied. The fetal weight was estimated at the time of admission. All pregnant women at term were included into study while multiple gestation, malpresentation, polyhydramnios, oligohydramnios, fibroid or any adnexal masses, any congenital anomaly were excluded from the study. The fetal weight was estimated by using Johnson's Formula:

Fetal Weight (grams) = (McDonald's measurement of symphysiofundal height in Cm - X)155.

McDonald's measurement was taken. Station of presenting part was noted.

X=13, when presenting part at minus station,

X=12, when presenting part at zero station,

X=11, when presenting part at plus station

The statistical analysis done by SPSS 17 version.

The means weight of baby's at birth was 2643 gms with 331.14 standard deviation on either side. Minimum value of Johnson's formula was below that of minimum 2000 actual weight of babies.

Table 2: Showing error the predicted weight from the actual weight by Johnson's formula

Methods	Mean	Std. deviation	Minimum	maximum
Error Johnson	273.8	483.4	-1624.0	1815.0

Table 3: Showing percentage weight error by the predicted method from the actual weight of the babies

Method	Mean	Std. deviation	Minimum	Maximum
Error Johnson Error	11.3	19.3	-56.7	88.1

Table 4: Showing multiple comparisons of predicted birth weight with dependent variable as actual birth weight

Statistical analysis		Mean difference (A-B)	Std.error	Sig.	95% confidence interval	
(A)method	(B)method				Lower bound	Upper bound
Actual birth weight	Johnson formula) (gms.)	-273.81	37.36	.000	-347.14	-200.48

The Johnson's formula significantly differed from the actual birth weight (P<.000).

Table 5: Error in detection of expected weight from the actual birth weight in Johnson's formula

Difference Of birth weight	Error of Johnson formula Freq.	Percentage (%) %
50gms	13	6.5
100gms	15	7.5
150gms	27	13.5
200gms	8	4
>200gms	137	68.5
total	200	100

In Johnson's formula error of more than 200gms had it in 68.5% babies.

Table 6: Showing overestimation and underestimation of birth weight by Johnson's formula:

Weight in grams	Overestimation of weight		Underestimation of weight	
	Frequency	Percent	Frequency	percent
50gms	4	2.0	9	4.5
51 to 100 gms	7	3.5	8	4.0
101 to 150 gms	13	6.5	3	1.5
151 to 200gms	11	5.5	8	4.0
>200 gms	113	56.5	24	12.0
Total	148	74	52	26

In 74% babies birth weight was overestimation by Johnson's formula, of them 56.5% babies weight was estimated above 200 gms. Birth weight was underestimated in 26% babies and 12% babies had weight determined less than 200gms of actual weight.

Table 7: Showing the accuracy in measurement of birth weight by Johnson's formula:

Weight in grams	Jonson's formula
0 gms	0.5
50 gms	6.5
100 gms	14.0
150 gms	27.0
200 gms	31.5
>200 gms	100.0

Johnson's formula can predict accurately in 14% with 100gms difference.

Discussion

In present study, determined weight by Johnson's formula had mean error of 273 gms over that of actual

weight, Johnson's formula could determine 41% accurately birth weight with an error of 10% which is also comparable with the study by Bhandari A, Pinto PG and Shetty AP (2004) [9] that showed an accuracy

of 41%. On the contrary, study by Sharma R and Bhardwaj NA (2002) [15] could determine 75.45% of cases with an error up to 10%. Also the mean error in present study with Johnson's formula was 273.81gms which is comparable to study by Bhandary A, Pinto PJ and Shetty AP (2004) [9] where it is around 292.51 gms.

Conclusion

From our study it can be concluded that Johnson's Formula is least accurate in predicting fetal birth weight so other methods like Ultrasonography and Symphysiofundalheight measurementsshould be used to calculate the fetal birth weight. However, in a developing country like INDIA, where modern facilities like ultrasonography are not universally available, a simple method which does not involve the use of costly equipment and can be used on a mass scale for the general population is desirable. The formula devised by Johnson has advantages that: no sophisticated instruments are required, no special skill or experience is needed, do not require extra expenditure, and it is convenient.

Thus, fetal weight estimation would help in successful management of labour and care of newborn.

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