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Original Research Article

A Hospital Based Comparative Study Estimating Fetal Weight using Johnsons Formula and the Actual Birth Weight of Newborn Babies Born

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Conflict of interest: Nil

Abstract

Aim: The aim of the present study was to regulate the fetal weight precision by means of Johnson's formula and comparing it as per the definite birth weight.

Methods: The present study was conducted in the Department of Obstetrics and Gynaecology for 12 months . Study included a total of 200 pregnant women attending the OPD with full term pregnancy till onset of labour, fulfilling the inclusion criteria.

Results: Mean birth weight Johnson's formulae and actual birth weight was 3.16 Kg and 2.75 Kg respectively. Majority of the children were 2.5-3 kgs followed by 3-3.5 kgs. Johnson's formulae co-relate well with actual birth weight (r-0.90; 95% CI: 0.88-0.92), though prediction of fetal weight was slightly on a higher side. The least correlation was reported in cases with weight <2.5 kg (r-0.34; 95% CI: 0.16-0.58). Between the clinical as well as the actual birth weight the mean variance was an overestimation of 0.246 Kg i.e. an error of 8%. In 58% cases the difference was within range of 10%. The mean difference in estimation was highest in the babies having low birth weight i.e. <2.5 Kg.

Conclusion: The observation means there's clearly a contribution for clinical of birthweight estimation as a device of analysis, signifying that clinical estimation is actually adequate to handle delivery and labour for a phrase pregnancy. Even in macrosomic foetus weight estimation for decision making concerning towards labour trials, no benefit appears to be there for gaining a regular sonographic birthweight.

Keywords: Birth weight, Birth weight estimation, Johnson's formulae, Symphysio-fundal height

Introduction

Precise fetal weight assessment is a problem which is associated where resources are low or subject to availability, especially in developing country like ours where major population still resides in rural area. From a multifactorial perspective the analysis of birth weight must be recognised. [1] Antenatal care aims on identifying large and small gestational age fetuses, since they are always at the perinatal mortality or morbidity risk. By decreasing the complications linked to the birth or excessively large or small foetus that needs precise weight estimation of the foetus prior to the delivery decision. [2] Restricted growth of both the intrauterine as well as macrosomia benefits the fetuses through evaluating the weight which could also diminish the risk of complications during maternal and neonatal. [3] With small foetuses, foetal demise, birth asphyxia, neonatal hypothermia and hypoglycaemia and meconium aspiration all are increased not only due to the small size, the organs of the foetus but also functions sub-maturely. [4] In childhood there is a subtle impairment in cognitive performance and educational performance reported in these children. [5] Complications spanning up to long durations also includes high risk of stroke, dyslipidaemia, Type II diabetes mellitus, hypertension, or coronary heart diseases.

Pre-natal fetal weight prediction is helpful, for instance, in determining intra-uterine growth restriction (IUGR) which is necessary in planning for peri-natal management of such babies. [6,7] Maternal risks associated with the delivery of an excessively large fetus include birth canal and pelvic floor injuries, as well as postpartum

hemorrhage. The incidence of cephalopelvic disproportion (CPD) is also higher among macrosomic fetuses compared with microsomic ones with such excessive weight fetuses often requiring 'operative vaginal delivery or cesarean delivery. [8] Infant mortality rates (pre and peri-natal) are more sensitive to fetal birth weights than to their gestational ages and the delivery of macrosomic fetuses is a major obstetric challenge with any attempt at vaginal delivery often requiring 'considered attention' by an experienced obstetrician and preparedness for operative delivery, shoulder dystocia and newborn asphyxia. [9,10]

For the fetal weight estimation numerous clinical formulas like Johnson's formula and Dawns, Dare's, Risanto's formula have been used. Moreover, one of the approaches is there for the measurement of SFH which has now found to be prevalent for the fetal weight estimation by means of the Johnson's Formula since it is inexpensive and readily available with the help of nonelastic measuring tape. Though sonography is accurate, it is costly and entails to have special skill as used in terms of a screening tool for the detection of abnormal growth but since in our nation most of the population is rural oriented therefore women from poor resource settings lack access to reliable method of fetal weight estimation because of lack of sonography techniques. Pregnancies with lower risk a recommendation is made regarding the SFH: Symphysio-Fundal Height measurement which is a screening tool, used at initial levels and is not much expensive. [11-13]

The aim of the present study was to regulate the fetal weight precision by means of Johnson's formula and comparing it as per the definite birth weight.

Materials and Methods

The present study was conducted in the Department of Obstetrics and Gynaecology, Nalanda Medical College and Hospital, Patna, Bihar India for 12 months. Study included a total of 200 pregnant women attending the OPD with full term pregnancy till onset of labour, fulfilling the inclusion criteria.

Inclusion Criteria

1. Pregnancy with singleton fetus
2. Vertex presentation

Exclusion Criteria

1. Patients with sonographically diagnosed IUGR
2. Pregnancy with complicated chronic disease
3. Pregnancy with diagnosed oligohydramnios and polyhydroamnios
4. Pregnancy with Intra uterine death
5. Pregnancy with uterine or abdominal mass
6. By the pre-eclampsia/eclampsia, HELLP syndrome no earlier pregnancy have been affected.
7. Patients with LMP not known or unsure of LMP or patients with lactational conception

Methodology

In the following ways the data for the given study has been attained:

1. By detailed clinical history, abdominal and pelvic examination.
2. By fundal height measurement and station identification
3. By fetal weight calculation using Johnson's clinical formula
4. By measuring outcome (weight of fetus)

Fundal Height Measurement

Firstly, patient need to empty their bladder also by means of non - elastic, a flexible, standard sewing measuring tape in centimetres symphysio fundal height has been measured. For the measurement's patient have to lie flat over her back by letting her legs extended. The measurement of the fundal height has been from center of the pubic symphysis upper border to the uterine fundus peak point.

Station Identification

A technique having "five-level is utilized for station designation. When doing a vaginal observation, probably the lowermost part of the" existing fetal component is actually over the ischial spines level. It's specified as actually set at 0 (zero) "station. Levels over the spines are actually specified in centimetre using stations of negative values, -2, -1, -3. Levels beneath the spines are actually specified in positive value, +1, +2, +3 facilities, right downcast to the pelvic floor.

Johnsons Formula

Fetal weight in grams = (symphysio fundal height in cm –X) *155 Where,

X=13, when presenting part is not engaged

X= 12, when presenting part is at station 0

X= 11, when presenting part is at station" +1[14]

Fetal Outcome (weight in grams)

In the delivery room the actual weight has been retrieved either delivered normally or if delivered by cesarean section, in operation theatre. As per the scale which was properly balanced the baby had been placed unclothed in the centre. In grams the weight has been verified.

3. Data Analysis

In terms of mean (±SD), frequencies (in numeral cases) along with appropriate percentages of the data have been defined statistically. The Pearson

correlation was used to test the level of correlation amid of the weight estimation by Johnson's formulae and actual weight. For the efficacy evaluation the Linear Regression analysis has been carried out as per the Johnson's formulae as a birth weight predictor. As per the statistically substantial probability value (p value) minimal to 0.05 has been measured. Using the computer programs all the statistical calculations has been done" SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) version 21 and Microsoft Excel 2007" (Microsoft Corporation, NY, USA).

Results

Table 1: Birth weight distribution by actual birth weight and Johnson's formulae

Birth weight in grams	Actual Weight N%	Johnson Formulae N%
<2	1 (0.5)	0
2-2.5	9 (18)	1 (0.5)
2.5-3	90 (45)	92 (46)
3-3.5	70 (35)	76 (38)
>3.5	30 (15)	31 (15.50)
Total	200	200
Mean±SD	2.75±0.32	3.16±0.39

Mean birth weight Johnson's formulae and actual birth weight was 3.16 Kg and 2.75 Kg respectively. Majority of the children were 2.5-3 kgs followed by 3-3.5 kgs.

Table 2: Correlation between Johnson's formulae and actual birth weight

Birth weight in grams	r value	95% CI
2-2.5	0.34	0.16-0.58
2.5-3	0.52	0.48-0.62
3-3.5	0.64	0.57-0.74
>3.5	0.36	-0.64
Total	0.90	0.88-0.92

Johnson's formulae's co-relates well with actual birth weight (r-0.90; 95% CI: 0.88-0.92), though prediction of fetal weight was slightly on a higher side. The least correlation was reported in cases with weight <2.5 kg (r-0.34; 95% CI: 0.16-0.58).

Table 3: Absolute error in Johnson's formulae for prediction of actual birth weight

Absolute error (gms)	N%
< 0.15	32 (16)
0.15 - 0.25	60 (30)
0.25 - 0.35	56 (28)
0.35 - 0.50	36 (18)
>0.50	16 (8)
Total	200

Between the clinical as well as the actual birth weight the mean variance was an overestimation of 0.246 Kg i.e. an error of 8%. In 58% cases the difference was within range of 10%.

Table 4: Percentage error in Johnson's formulae for prediction of actual birth weight

Absolute error (gms)	N%
< 5	36 (18)
5-10	80 (40)
10-15	50 (25)
15 - 20	20 (10)
20 - 25	8 (4)
25 - 30	2 (1)
30 - 40	4 (2)
Total	200 (100)

The mean difference in estimation was highest in the babies having low birth weight i.e. <2.5 Kg.

Discussion

Fetal weight is a very important factor based on which decision must be made concerning labor and delivery. The accuracy of clinical methods of fetal weight estimation was similar to sonographic estimation at term. [15-17] Clinical methods of estimation of fetal weight has been shown to be as good as ultrasound at term, giving estimates that are correct to within 10% of the birth weight in 60% to 70% of cases. In developing countries, ultrasonography may be unavailable or may not be

affordable by patients. Even if available, such measurements may be inaccurate during labour and at term. [18]

In modern obstetrics accurate estimation of fetal weight is of paramount importance in the management of labor and delivery as it is one of the risk factors which can be anticipated during antenatal period and guides in making decision regarding mode of delivery and in prevention of many intranasal complications, like maternal exhaustion, prolonged labor, atonic and traumatic postpartum hemorrhage. It has been incorporated into the standard routine antepartum evaluation of high-risk pregnancies and deliveries. [19,20] Foetal weight is usually taken as the sole criterion to assess fetal growth. Fetus with a birth weight of less than the 10th percentile of those born at same gestational age or two standard deviations below the population mean, are considered growth restricted. These foetuses fail to achieve its genetic potential and consequently are at risk of increased perinatal morbidity and mortality [21,22] and are more likely to experience poor cognitive development and neurologic impairment during childhood.

In comparison to an assessed single examination the evaluation viewed that different biometric of obstetric sonographic foetal might be superior and has found to be helpful. [23,24] Numerous well-known technical limitations are there for analysing foetal weight using sonographic technique. Amongst these given are as oligohydramnios, “maternal obesity, and anterior placentation. There are other drawbacks of ultrasonography that is equally complicated as well as labour intensive, being limited” as in potential manner by foetal structure’s suboptimal consideration. Expensive specially trained personnel along with the sonographic equipment is also required by this. Although in developed countries such costly imaging equipment is extensively available, is generally “this is not the terms in developing nations alike ours where the scarce of medical resources” exists. [24,25]

Mean birth weight Johnson’s formulae and actual birth weight was 3.16 Kg and 2.75 Kg respectively. Majority of the children were 2.5-3 kgs followed by 3-3.5 kgs. Johnson’s formulae’s co-relates well with actual birth weight (r-0.90; 95% CI: 0.88-0.92), though prediction of fetal weight was slightly on a higher side. The least correlation was reported in cases with weight <2.5 kg (r-0.34; 95% CI: 0.16-0.58). Our study findings are as per the analysis of Shittu et al., [26] where the mean of birth weight through Clinical method was 3.29 while the mean actual birth weight remained 3.25 Kg. In a similar study Siddiqua S et al., [27] observed the weight by clinical method as 3.59 kg while the definite birth weight remained 3.22 Kg. Bhandary A et al. [28] in their study also observed mean birth weight with clinical method as 3.11 and actual birth weight as 2.99 Kg. Pravin Z et al. [29] in a similar study in Bangladesh mean birth weight as prophesied by clinical (Johnson’s formulae) as well as the actual birth weight as 3.08 Kg and 2.99 Kg respectively.

Between the clinical as well as the actual birth weight the mean variance was an overestimation of 0.246 Kg i.e. an error of 8%. In 58% cases the difference was within range of 10%. The mean difference in estimation was highest in the babies having low birth weight i.e. <2.5 Kg. Correlation analysis amid “of the fetal weight and the actual birth weight” (Johnson’s Formula) by Pravin et al29 knowingly discovered that the correlation of the“ actual birth weight with fetal weight (found by Johnson’s Formula).” However, the correlation was weak for babies less than 2.5 Kg and more than 4.0 kg. Joshi et al [30] in their study also observed strong positive correlation “($p<0.001$) between actual birth weight in comparison to the clinical” approach.

Conclusion

The observation means there’s clearly a contribution for clinical of birthweight estimation as a device of analysis, signifying that clinical estimation is actually adequate to handle delivery and labour for a phrase pregnancy. Even in macrosomic foetus weight estimation for decision making concerning towards labour trials, no benefit appears to be there for gaining a regular sonographic birthweight. The role of estimation in the ultrasonographic seems that, when clinically it was estimated as the proposes weight is less “than <2,500 g, right after sonographic estimation may deliver a much better prediction as well as would be” additionally essential to evaluate these kinds of fetuses for congenital malformation as well as to complete the biophysical profile to figure out as the foetus well-being.

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