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Descriptive study on measurement of fetal weight and birth weight at a tertiary care hospital

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Abstract
The fetal weight is also determined by adequate supply of the nutrients. The literature shows that the increase in size of the fetus affords conclusive evidence that materials in solution must pass form the maternal to the fetal circulation. The excessive and diminished maternal glucose availability to the fetus affects the fetal growth. Excessive glycemia produces macrosomia, whereas diminished glucose levels is associated with the fetal growth restriction. A detailed history was obtained from all the patients who were selected in the study. A predesigned and pretested proforma was administered for this purpose. The proforma included socio – demographic data, general physical examination and obstetrical examination. The physical examination also included Johnson's formula. About 36% of the babies born to pregnant women had birth weight between 2.5 – 3 kgs and the birth weight of 30% of the babies was 3 – 3.5 Kgs. The predicted weight by Johnson's formula was between 3 – 3.5 Kgs in 38% and 2.5 – 3.0 Kgs in 31% of the pregnant women. The ultra sonographic weight of 44% of the pregnant women was between 3 – 3.5 Kgs, and 35% of the women had predicted weight of 2.5 – 3.0 Kgs.

Introduction

The estimation of fetal weight prior to birth were tried by different clinical methods previously. The main drawback of such methods was that they provided rough approximation of fetal weight since the palpated dimensions of the uterus were affected by several factors other than the size of the fetus. In a healthy pregnancy, fetuses normally gain about 5 grams from 14 – 15 weeks, 10 grams per day by 20 weeks, and 30 – 35 grams per day from 32 – 36 weeks. During the last month of pregnancy, the growth rate decreases and then they levels off around the 40th week of gestation [1].

The fetal weight is also determined by adequate supply of the nutrients. The literature shows that the increase in size of the fetus affords conclusive evidence that materials in solution must pass form the maternal to the fetal circulation. The excessive and diminished maternal glucose availability to the fetus affects the fetal growth. Excessive glycemia produces macrosomia, whereas diminished glucose levels is associated with the fetal growth restriction. The macrosomic children of mildly diabetic mothers are the prototypical example of the effects of excessive maternal glucose supply. Such infants are also characterized by fetal hyperinsulinism and elevated umbilical cord levels of IGF- I and IGF – II [2].

The information is scarce regarding the physiology of maternal – fetal transfer of other nutrients such as amino acids. In a study, Ronzon *et al*. have studied the concentrations of amino acids in 26 normal pregnancies at the time of cesarean delivery. An increase in maternal amino acid levels led to an increase in fetal levels. In growth restricted fetuses, the amino acid disturbance similar to the biochemical changes seen in postnatal starvation states was detected [3].

The placenta plays an important role in the growth of the fetus. The trophoblasts from the fetus invade the uterine endometrial lining and obliterate the muscular walls of the uterine spiral arteries [4]. The spiral arteries convert to maximally dilated utero-placental arteries allowing the development of a high volume, low resistance circulation. There is also proliferation in the villi and small vessels in the placental vascular bed during the second and third trimesters. The placental vascular resistance decreases and blood flow through the umbilical artery increases as the number of vessels increases. This increase in blood flow volume through the uterine and umbilical arteries is necessary to meet the increasing nutritional demands of the rapidly – growing fetus in the pregnancy. Pathophysiological processes which inhibit the trophoblastic

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invasion, obstruct the blood flow, or decrease delivery of oxygen and nutrients from the uterus thus impairing the fetal growth [5, 6].

Methodology
A prospective observational study was undertaken in the Department of Obstetrics and Gynaecology among total of 100 women attending the OPD who satisfied the inclusion criteria were included as study samples. An informed, written, bilingual consent was taken from all the pregnant women who were enrolled into the study.

Inclusion Criteria
- All the term pregnancies between 37 – 42 weeks.
- All the pre-term pregnancies between 28 – 37 weeks.
- Singleton pregnancies with vertex presentation.
- Women who had gestational age confirmed by dates and ultrasound scanning before 22 weeks.

Exclusion Criteria
- Abnormal lie and presentation
- Multiple pregnancies
- Obvious congenital abnormalities

A detailed history was obtained from all the patients who were selected in the study. A predesigned and pretested proforma was administered for this purpose. The proforma included socio – demographic data, general physical examination and obstetrical examination. The physical examination also included Johnson's formula.

Results

Table 1: Distribution of the study subjects according to Gravidity

Gravida	Frequency	Percent
Primigravida	57	57.0
Multigravida	43	43.0
Total	100	100

Table 2: Distribution of the study subjects according to Gestational age at delivery

GA at delivery	Frequency	Percent
Less than 37 weeks	28	28.0
37.1 – 40 weeks	62	62.0
More than 40 weeks	10	10.0
Total	100	100

The gestational age of about 62% among the pregnant women had gestational age of 37.1 – 40 weeks, 28% had gestational age of less than 37 weeks and 10% had gestational age of more than 40 weeks.

Table 3: Comparison of birth weight with Johnson's formula weight and Ultrasound weight

Weight	Birth weight		Johnson's formula		Ultrasound weight	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Less than 2 Kgs	8	8.0	1	1.0	0	0
2 – 2.5 Kgs	13	13.0	11	11.0	4	4.0
2.5 – 3 Kgs	36	36.0	31	31.0	35	35.0
3 – 3.5 Kgs	30	30.0	38	38.0	44	44.0
3.5 – 4 Kgs	10	10.0	17	17.0	11	11.0
4 – 4.5 Kgs	3	3.0	0	0	6	6.0
Total	100	100	100	100	100	100

About 36% of the babies born to pregnant women had birth weight between 2.5 – 3 kgs and the birth weight of 30% of the babies was 3 – 3.5 Kgs. The predicted weight by Johnson's formula was between 3 – 3.5 Kgs in 38% and 2.5 – 3.0 Kgs in 31% of the pregnant women. The ultra sonographic weight of 44% of the pregnant women was between 3 – 3.5 Kgs, and 35% of the women had predicted weight of 2.5 – 3.0 Kgs.

Table 4: The mean and standard deviation of Ultrasound predicted, Johnson's predicted and Birth weights

Weight	Mean (in gms)	SD (in gms)
Ultrasound weight	3082.5	466.4
Johnson formula	3144.6	430.5
Birth weight	2978.5	578.8

The mean (± SD) ultrasound predicted weight was 3082.5 (± 466.4) gms, the clinical weight estimation by using Johnson's formula was 3144.6 (± 430.5) gms and the birth weight was 2978.5 (± 578.8) gms.

Discussion
The birth weight is the greatest factor which determines the survival of the fetus. It is one the important determinant of neonatal survival. Accurate estimation of fetal weight is of paramount importance in the management of labor and delivery. It mainly helps the obstetrician to decide the mode of delivery and also helps in anticipation of problems and shoulder dystocia during labour [1].

The literature available suggests that there has been a marked reduction of perinatal deaths in developed countries (10 per 1000 births in developed countries), even though the perinatal death in developing countries like India remains high (60 per 1000 births) [2]. The fetal weight estimation has been incorporated into the standard routine antenatal evaluation of high risk pregnancies to decide on the mode of delivery and to anticipate the problems during labour [3].

The fetal weight can be estimated by using maternal characteristics by using birth weight prediction equation. However, this method included application of a quantitative birth weight prediction equation that is based on maternal and pregnancy specific factors. Other methods include use of abdominal girth, Johnson's formula and Dawns formula [5].

Ultrasound is most modern and technologically dependent method for assessing the foetal weight which relies on foetal measurements and forms a gold standard. It mainly helps in estimation of various diameters of the foetus. Various formulas are used worldwide including Hadlock formula, Shepard formula, Tokyo university formula, Osaka university formula, Campbell, Hansman, Sabbagha, Worsof Aoki formula [7].

Currently-available techniques for estimating the foetal weight have significant degree of inaccuracy as evident by various studies. Limiting the potential complications associated with

birth of both small and excessively large foetuses requires that accurate estimation of foetal weight occurs in advance of deliveries [8].

In order to resolve the controversies of different methods in weight estimation, this study was undertaken to determine the most accurate method to estimate fetal weight. Thus it improves the management of labor by comparing the accuracy of clinical and ultra sonographic estimation of fetal weight at term and its correlation with actual fetal weight.

More than 66% of the pregnant women delivered weighed more than 2.5 Kgs. The predicted weight by Johnson's formula was more than 2.5 Kgs in 68% of the cases. The ultra sonographic weight of 79% of the pregnant women was more than 2.5 Kgs. The mean ultrasound predicted ultrasound weight was 3082.5 gms, the clinical weight estimation by using Johnson's formula was 3144.6 gms and the birth weight was 2978.5 gms. In a study by Ashraf ganjooei *et al.*, the mean actual birth weight was 3339 gms, the ultrasound estimated weight was 3305 Kgs and estimated weight by Johnson formula was 3321 gms [9]. In a study by Alnaksh *et al.*, the mean clinical weight was 3457 gms, estimated ultrasound weight was 3109 gms and actual birth weight 3376 gms [10].

Conclusion
- About 66% of the babies born to pregnant women had birth weight between 2.5-3.5 kgs. The predicted weight by Johnson's formula was between 2.5-3.5 Kgs in 69% of the pregnant women.
- The ultra sonographic weight of 79% of the pregnant women was between 2.5-3.5 Kgs.

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