Research Article

A comparative study of ultrasonographic birth weight with neonatal birth weight in a first referral unit of Guwahati

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Abstract

Background: Examining fetal growth regularly is a regular component of antenatal care. Several equations have been formulated by investigators for calculating fetal weight in the late second and the third trimesters. Birth weight serves as a parameter of intrauterine growth of the fetus, and its determinants are extensively studied. However, little is known about determinants of differing patterns of growth *in utero*.

Objective: To study any significant difference in ultrasonographic birth weight and neonatal birth weight in primipara and multipara.

Materials and Methods: A cross-sectional study was carried out in Dhirenpara maternity and child welfare hospital [first referral unit (FRU)], Guwahati, Assam, India, from December 1, 2014, to December 30, 2014. Ultrasonography (USG) was performed for the patients of term pregnancy (after 37 weeks). But, the patients who delivered within 10 days of the USG and those who delivered spontaneously were only included in this study.

Result: In this study, we found that the neonatal birth weight increases with increase in ultrasonographic birth weight in both primipara and multipara ($t = -0.653$. and $t = -0.615$, respectively). Therefore, the P value of the correlation showed no significance, which proves the hypothesis that there is no significant difference between ultrasonographic birth weight and neonatal birth weight.

Conclusion: The study shows that neonatal birth weight can be predicted by USG without any significant error. Prediction of birth weight helps in taking vital decisions during delivery in an FRU as there is a shortage of required infrastructure compared with a tertiary health-care unit.

KEY WORDS: Ultrasonographic birth weight, neonatal birth weight, first referral unit, Guwahati

Introduction

Fetal weight is an important predictor of perinatal morbidity, mortality, and maternal mortality. Precise estimation of fetal weight is of top priority in high-risk pregnancies for the management of labor.[1] In the high-risk conditions such as intrauterine growth restriction (IUGR), preterm labor, breech presentation, previous lower segment cesarean section, and macrosomia, fetal weight greatly influences the strategies of management of the labor and delivery by timely interventions. An infant born with IUGR is more likely to experience noteworthy compromise. The major two methods used in predicting birth weight are clinical method and ultrasonography (USG).[2,3]

Ultrasound has become the essential tool of modern obstetric practice. The assignment of pregnancy age is the first task placed before the care provider, and ultrasound is the key modality used for this purpose.[1] Evaluation of the correlation between the estimated fetal weight (EFW) by USG

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and the neonatal birth weight (NBW) is important. Generally, there is a very good relationship between ultrasound estimates of fetal weight and actual birth weight; however, the limits of agreement are reasonably wide. Ultrasound estimates of birth weight overestimates the neonatal weight by an average of 52 g.[2,3] The body weight of a baby at its birth is called birth weight.[4] Exact calculation of fetal weight *in utero* is an important information for the practicing obstetrician.

Birth weight serves as a parameter of intrauterine growth of the fetus, and its determinants are extensively studied. However, little is known about determinants of differing patterns of growth *in utero*. Birth weight is one of the readily available but most misunderstood variables in epidemiology. Although, only to a lesser extent, a baby's birth weight is associated with development problems in childhood and risk of various diseases in adulthood, it is significantly associated with mortality risk during the first year. Epidemiological analysis had shown that birth weight forms the casual pathway to these health outcomes. With this hypothesis of causality, birth weight is used to study the variations associated with infant mortality and later morbidity and also serves as an in-between health endpoint in itself.

A community-based cross sectional study was carried out to assess the magnitude of ultrasonographic birth weight (UBW) with that of NBW in an urban slum community, which was carried out in a First Referral Unit (FRU) hospital, which is situated in outskirt area of Guwahati, Assam, India, where both urban slum and rural people are the patients. The intention for choosing the hospital is to conduct the study in majority of same category of women attending from vast area and obstetrician has to take decision to interfere in complicated pregnancy with minimum aid.

Since the mid-1960s, ultrasound has been used as a tool in the determination of fetal size. Regrettably, the various formulas used in the estimation of fetal weight by USG have not been as precise in predicting weight as clinicians would desire to make management decisions. Ultrasound has constantly showed an error of ±8%–15%.[5–14] Prominently, it has the highest error in determining fetal weight near term during which an accurate fetal weight is significant for obstetrical management. For estimation of birth weight, one sonogram between the gestation period of 34 and 37 weeks is recommended. The two criteria, gestational age (GA) and birth weight (BW), are used to recognize newborns at risk for neonatal morbidity. Currently, GA less than 37 weeks is known as preterm; BW less than 2.5 g is low birth weight (LBW); and BW less than the tenth percentile weight for an infant's GA is small for GA.[15]

Birth weight is associated with long-term effects on health and disease in adult life. LBW is a well-established risk factor for adverse long-term health, particularly cardiovascular disease and metabolic syndrome.[16] Numerous studies have identified determinants of abnormal birth weight, not only of LBW but also, more recently, of high birth weight.[17] Birth weight serves as an indicator of intrauterine growth of the fetus. However, the definite growth pattern *in utero* can only be estimated by successive ultrasound measurements during the pregnancy period. Very little is known about the determinants of differing growth patterns *in utero* than that of abnormal birth weights. Fetal growth is achieved by the action of multiple factors such as genetic potential for growth, maternal nutrition, maternal metabolism, endocrine factors, and placental perfusion and function.[18] Furthermore, the capacity of the fetus to react to nutrients and other growth regulatory factors may also play a role.

Birth weight has been considered as a dichotomy for most of the previous centuries. Babies weighing less than 2.5 g at birth are considered as LBW and remaining all as "normal birth weight." For many years, preterm delivery was the alleged reason for babies to be born LBW. From the 1920s to the 1960s, these two terms, LBW and premature, were indeed used interchangeably in the scientific literature.[19]

A systematic review of studies included 11 different methods used in fetal weight estimation to compare ultrasound EFW with BW. These studies consistently observed that, in 5% of fetuses, the random error in fetal weight estimation exceeded 14% of birth weight. Both the intraobserver and interobserver variability was large. The authors concluded that although volumetric methods possessed some advantages, there was no consistently better method of sonographic determination of fetal weight.[20]

Table 1: Distribution of birth weight in both primipara and multipara

Serial	Range (kg)	Primipara		Multipara	
		UBW	NBW	UBW	NBW
1	2.0–2.5	4	4	10	7
2	2.5–3.0	16	13	17	17
3	3.0–3.5	8	9	1	4
4	3.5–4.0	0	2	0	0
Total		28	28	28	28

Table 2: Paired samples statistics of primipara

Pair 1	Mean	*N*	SD	SEM
Ultrasonographic birth weight	2.8971	28	0.33889	0.06404
Neonatal birth weight	2.9286	28	0.30654	0.05793

Table 3: Paired samples correlations of primipara

Pair 1	*N*	Correlation	Significance
UBW and NBW	28	0.693	0.000

Objective

This study aimed to find out the correlation between UBW and NBW in both primipara and multipara.

Materials and Methods

A cross-sectional study was carried out in Dhirenpara maternity and child welfare hospital (FRU), Guwahati, from December 1, 2014, to December 30, 2014.

Table 4: Paired samples test of primipara

Pair 1	Paired Differences					*t*	*df*	Significance (2-Tailed)
	Mean	SD	SEM	95% Confidence Interval of the Difference				
				Lower	Upper			
UBW and NBW	–0.0314	0.25469	0.04813	–0.1302	0.0673	–0.653	27	0.519

No significant difference between UBW and NBW of primipara as $t = -0.653$, $P = 0.5$.

Table 5: Paired samples statistics of multipara

Pair 1	Mean	N	SD	SEM
Ultrasonographic birth weight	2.6618	28	0.30845	0.05829
Neonatal birth weight	2.6964	28	0.26734	0.05052

Table 6: Paired samples correlations of multipara

Pair 1	N	Correlation	Significance
UBW and NBW	28	0.471	0.011

Selection and Description of Participants

The study group comprised patients with singleton pregnancies who underwent sonograms between 34.0 and 36.9 weeks' gestation (period 1) and at 37 weeks and beyond (period 2). UBW of primigravida and multigravida was compared with NBW with paired *t* tests.

Inclusion Criteria

1. Women with uncomplicated pregnancy after 37 weeks
2. No history of diabetes mellitus
3. Primigravid and second gravid
4. Second trimester sonography showed normal development
5. Only subjects with normal delivery
6. Delivery strictly 10 days after USG.

Exclusion Criteria

1. Women with complicated pregnancy
2. History of diabetes mellitus
3. Elderly primigravid and third gravid onward
4. Small-for-date baby in previous sonography.
5. All subjects who delivered through cesarian section
6. Period between USG and delivery more than 10 days.

USG was taken from the patients of term pregnancy (after 37 weeks). But, the patients who delivered within 10 days of the USG and those who delivered spontaneously were only included in this study.

Statistical Analysis

Data were entered in MS Excel, and a descriptive analysis was done. Furthermore, for comparing quantitative, paired *t* test was applied by using IBM SPSS (recent version) considering $P < 0.05$ to be significant.

Results

The findings of the study were described in tables 1 to 7.

Discussion

The descriptive figures and tables show the distribution of both UBW and NBW in primipara and multipara.

Shows NBW in primipara. It shows that 14% of the population weighed 2.0–2.5 kg; 57%, 2.5–3.0 kg; and 29%, 3.0–3.5 kg. Shows NBW in multipara. It shows that 14% of the population weighed 2.0–2.5 kg; 47%, 2.5–3.0 kg; 32%, 3.0–3.5 kg; and 7%, 3.5–4.0 kg.

Shows UBW in primipara. It shows that 25% of the population weighed 2.0–2.5 kg; 61%, 2.5–3.0 kg; and 14%, 3.0–3.5 kg. Shows UBW in multipara. It shows that 36% of the population weighed 2.0–2.5 kg; 61%, 2.5–3.0 kg; and 3%, 3.0–3.5 kg.

In this study, we have found that the NBW increases with increase in UBW in both primipara and multipara ($t = -0.653$ and $t = -0.615$, respectively). Therefore, the *P* value of the correlation shows no significance, which proves that there is no significant difference between UBW and NBW.

Accurate estimation of fetal weight is very important in obstetrics. It cannot be measured directly and must be estimated by fetal and maternal anatomical landmarks.[21] Various methods have been suggested by many workers

Table 7: Paired samples test of multipara

Pair 1	Paired Differences					*t*	*df*	Significance (2-Tailed)
	Mean	SD	SEM	95% Confidence Interval of the Difference				
				Lower	Upper			
UBW and NBW	–0.0346	0.29827	0.05637	–0.1503	0.0810	–0.615	27	0.544

No significant difference between UBW and NBW of multipara as $t = -0.615$, $P = 0.5$.

all over the world. There have been various methods of estimating fetal weight with differing results of accuracy.[22] The most commonly used methods are clinical method and ultrasonographic methods. Very few studies have compared the precision of fetal weight determination by clinical and ultrasonic measurements. Any means that aid in recognition of IUGR and macrosomic babies will help obstetrician in deciding about the mode of delivery.

Conclusion

The study shows that NBW can be predicted by USG without any significant error. Prediction of birth weight helps in taking vital decisions during delivery in FRU as there is a shortage of required infrastructure compared with a tertiary health-care unit.

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