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Original Article

Pattern of Sonographically Estimated Fetal Weight and Actual Birth Weight Among Term Pregnancies

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ABSTRACT

Background: Fetal weight assessment is an important component of antenatal care, as accurate estimation of fetal weight assists in clinical decision-making and may help anticipate maternal and perinatal complications associated with abnormal fetal weight. Ultrasonography is widely used for fetal-weight estimation because it incorporates multiple fetal biometric parameters, although its accuracy may vary due to several maternal, fetal, and technical factors. **Objective:** The aim of the study was to assess the pattern between sonographically estimated fetal weight and actual birth weight among term pregnancies. **Methods & Materials:** This cross-sectional observational study was conducted at the Department of Obstetrics & Gynaecology, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh, from 17 March to 16 September 2018. A total of 100 singleton term pregnancies (37–41 weeks) were evaluated for sonographically estimated and actual birth weight. Data were analyzed using SPSS version 22.0 with paired t-test and Pearson's correlation; $p<0.05$ was considered significant. Written informed consent was obtained. **Results:** Among 100 term pregnancies, mean maternal age was 24.74 ± 4.53 years, with 56.0% aged 18–25 years and 74.0% primiparous. Mean sonographic EFW was 3.06 ± 0.42 kg versus actual birth weight of 3.11 ± 0.16 kg, showing a significant difference ($t = 2.21$, $p = 0.028$) and positive correlation ($r = 0.409$, $p < 0.001$). **Conclusion:** Sonographic fetal-weight estimation showed a pattern broadly comparable to actual birth weight among term pregnancies, with a significant positive relationship but some variation from the actual measurement.

Key words: *Fetal Weight, Ultrasonography, Term Pregnancy*

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INTRODUCTION

Fetal weight assessment represents an important component of routine antenatal care, particularly in high-risk pregnancies where close monitoring of fetal growth is essential [1]. Reliable estimation of fetal weight at term can assist the obstetrician in making clinical decisions concerning the likelihood of neonatal survival outside the uterus [1]. Birth weight is considered a major determinant of neonatal survival [2]. In addition, infants who are large for gestational age have an increased risk of neonatal complications [3]. Therefore, having adequate information about fetal weight in utero is important for the management of pregnancy, labour, and delivery, as it provides the obstetrician and neonatologist with an opportunity to anticipate and prevent maternal and perinatal morbidity and mortality associated with abnormal fetal weight [4].

Accurate estimation of fetal weight before delivery is important for appropriate clinical decision-making by the obstetrician or midwife [5]. In current obstetric practice, clinical examination and ultrasonography are the two principal approaches used for predicting foetal birth weight [3]. Ultrasonography (USG) has become widely accepted because it allows the incorporation of several fetal biometric parameters into regression equations, including biparietal diameter, abdominal circumference, femur length, and head circumference, as used in Hadlock's formula [6,7]. Sonographic estimation of foetal weight therefore utilizes measurements such as biparietal diameter (BPD), head circumference (HC), femur length (FL), and abdominal circumference (AC). Nevertheless, antenatal estimation of foetal weight in utero remains a challenging aspect of obstetric practice [8].

Compared with clinical palpation, ultrasonography is generally regarded as a more objective and reproducible method, with reported benefits in pregnancies complicated by abnormal fetal growth, altered maternal nutrition, and high body mass index [9]. Despite these advantages, the accuracy of ultrasonographic estimation may be affected by factors including operator skill, fetal position, placental location, and extreme fetal size [10]. Both clinical and sonographic methods of estimated fetal weight (EFW) have also been reported to have limitations in accuracy, with an error range of up to 10–15% [11]. The ultrasound method is generally a better predictor of the actual birth weight than the clinical method, and thus should be used in estimating the actual birth weight when accessible [12]. Furthermore, currently available sonographic algorithms have generally demonstrated comparable overall accuracy in the prediction of birth weight [13].

Variation in fetal-weight estimation has been reported, with some formulas showing a tendency to systematically overestimate or underestimate fetal weight, potentially influencing clinical decision-making [14]. Comparative investigations of clinical methods and ultrasonography have yielded variable findings. Some studies have reported better performance with ultrasonography, particularly among fetuses at the extremes of birth weight [15], whereas other studies have found similar performance between the two approaches, particularly among fetuses with a normal birth weight of 2500–4000 g. At present, there is no consensus regarding the superiority of one method over the other. Some studies have reported greater accuracy with sonographic EFW [12], while others have found clinical EFW to be equally or even more accurate than sonographic estimation [16]. Evidence comparing the accuracy of sonographic and clinical EFW remains limited in specific populations of women.

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Although ultrasonography is widely used for antenatal fetal-weight estimation, variation may occur between sonographically estimated fetal weight and actual birth weight. Assessing the relationship between these measurements in term pregnancies is therefore important to determine the extent to which sonographic estimation reflects actual birth weight and to support appropriate obstetric decision-making. The purpose of this study was to assess the pattern between sonographically estimated fetal weight and actual birth weight among term pregnancies.

OBJECTIVE

To assess the pattern between sonographically estimated fetal weight and actual birth weight among term pregnancies.

METHOD & MATERIALS

This cross-sectional observational study was conducted at the Department of Obstetrics & Gynaecology, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh, over a six-month period from 17 March 2018 to 16 September 2018. The study included women with term pregnancies who were clinically assessed at the Department of Obstetrics & Gynaecology, referred to the Radiology Department for ultrasonography, and subsequently delivered their babies in the department during the study period. Data regarding maternal age, gravida, parity, gestational week, sonographically estimated fetal weight, and actual birth weight were collected. Participants were selected according to specific inclusion and exclusion criteria.

Inclusion criteria

- Gestational age of 37–41 weeks with a known and reliable LMP.
- History of a regular menstrual cycle.
- Close agreement between menstrual age and clinically assessed gestational age.
- Singleton pregnancy.
- Live-born infant without congenital malformation or hydrops.

Exclusion criteria

- Preterm pregnancy.
- Multiple pregnancy.
- Advanced labour.
- Antenatal diagnosis of congenital fetal malformation on ultrasonography.
- Intrauterine fetal death.
- Women unwilling to participate in the study.
- Maternal obesity (absolute weight ≥95 kg).[15]
- Premature rupture of membranes.
- Antepartum haemorrhage.
- Unstable maternal condition, such as eclampsia.

Data were collected using a pre-designed, structured, and easily understandable questionnaire. Maternal age, gravida, parity, and gestational week were recorded, while sonographically estimated fetal weight was obtained by ultrasonography and actual birth weight was recorded following delivery. The collected data were checked, verified for consistency, edited, coded, and entered into a computer using SPSS version 22.0 (Statistical Package for the Social Sciences) for analysis. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequency and percentage. The mean sonographically estimated fetal weight was compared with the mean actual birth weight using a paired Student's *t*-test, and the correlation between sonographically estimated fetal weight and actual birth weight was assessed using Pearson's correlation coefficient. A p value <0.05 was considered statistically significant. The findings were presented in tabular and graphical forms. To ensure data quality, a work manual and standardized questionnaire were prepared, and the questionnaire was pretested to assess its clarity and comprehensibility before final data collection. Ethical approval and permission were obtained from the appropriate authority of Shaheed Suhrawardy Medical College Hospital, and the study was conducted in accordance with the principles of the Declaration of Helsinki (1964). The study involved minimal physical, psychological, social, and legal risk, and appropriate safety measures were maintained throughout the study. Access to the collected data was restricted to research personnel. All participants were informed about the study design, underlying hypothesis, and their right to withdraw from the study at any time without affecting their standard care. Written informed consent was obtained voluntarily from each participant.

RESULTS

Table I presents the baseline characteristics of the study participants, including their age, gravida, and parity. The mean age of the participants was 24.74 ± 4.53 years, with the majority aged 18–25 years (56.0%). Most participants were gravida 1–2 (68.0%) and primiparous (74.0%).

Table I
Baseline Characteristics of the Study Participants (n = 100).

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	18–25	56	56.0
	26–30	38	38.0
	>30	6	6.0
	Mean ± SD	24.74 ± 4.53 years	
	Range	18–38 years	
Gravida	1–2	68	68.0
	≥3	32	32.0
Parity	Primipara	74	74.0
	Multipara	26	26.0

Table II presents the distribution of the study participants according to gestational week. The highest proportion of participants were at 38 weeks of gestation (32.0%), followed by 40 weeks (24.0%), 39 weeks (22.0%), 37 weeks (14.0%), and 41 weeks (8.0%).

Table II
Distribution of the Study Participants by Gestational Week (n = 100).

Gestational week	Frequency (n)	Percentage (%)
37 weeks	14	14.0
38 weeks	32	32.0
39 weeks	22	22.0
40 weeks	24	24.0
41 weeks	8	8.0
Total	100	100.0

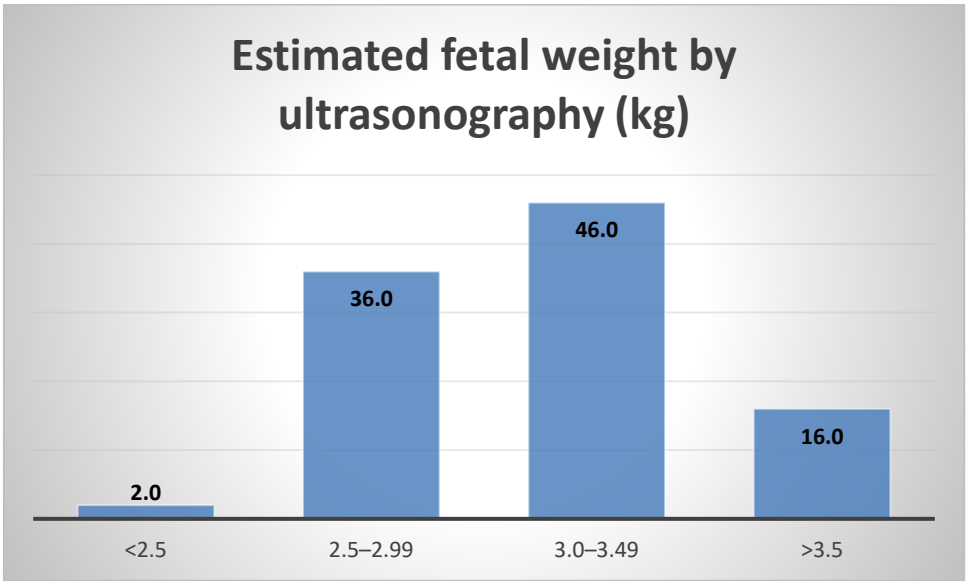


Figure 1. Distribution of Sonographically Estimated Fetal Weight (n = 100).

Figure 1 presents the distribution of sonographically estimated fetal weight. The majority of fetuses had an estimated weight of 3.0–3.49 kg (46.0%), followed by 2.5–2.99 kg (36.0%), >3.5 kg (16.0%), and <2.5 kg (2.0%). The mean sonographically estimated fetal weight was 3.06 ± 0.42 kg.

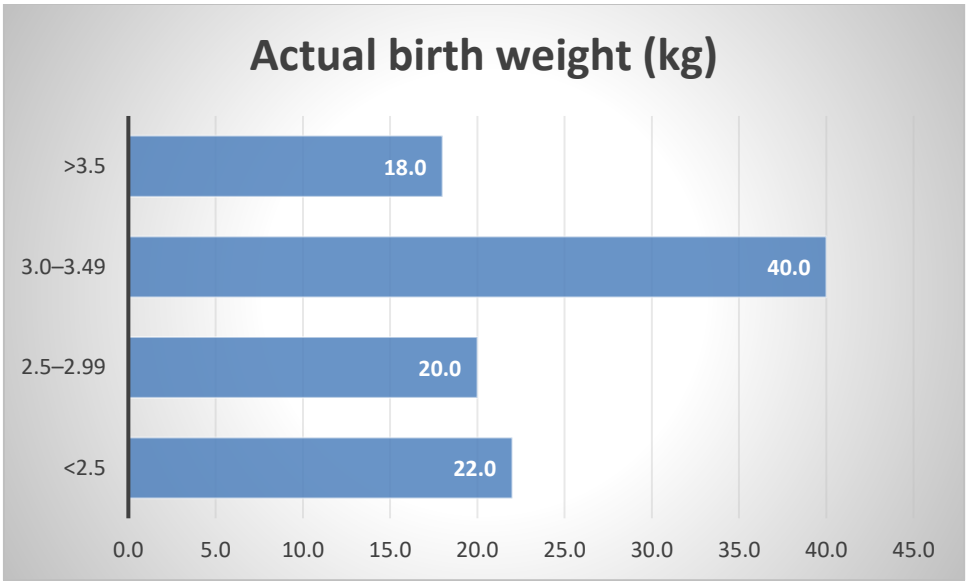


Figure 2. Distribution of Actual Birth Weight (n = 100).

Figure 2 presents the distribution of actual birth weight. The largest proportion of newborns had a birth weight of 3.0–3.49 kg (40.0%), followed by <2.5 kg (22.0%), 2.5–2.99 kg (20.0%), and >3.5 kg (18.0%). The mean actual birth weight was 3.11 ± 0.16 kg.

Table III presents the comparison between sonographically estimated fetal weight and actual birth weight. The mean sonographically estimated fetal weight was 3.06 ± 0.42 kg, whereas the mean actual birth weight was 3.11 ± 0.16 kg. A statistically significant difference was observed between the two measurements (t = 2.21, p = 0.028).

Table III.
Comparison of Sonographically Estimated Fetal Weight and Actual Birth Weight (n = 100).

Variable	Sonographically Estimated Fetal Weight, Mean ± SD (kg)	Actual Birth Weight, Mean ± SD (kg)	t	p value
Fetal weight	3.06 ± 0.42	3.11 ± 0.16	2.21	0.028

Table IV presents the correlation between sonographically estimated fetal weight and actual birth weight. A statistically significant positive correlation was observed between the two measurements (Pearson's r = 0.409, p < 0.001).

Table IV
Correlation Between Sonographically Estimated Fetal Weight and Actual Birth Weight (n = 100).

Variables	Pearson's r	p value	N
Ultrasonographic estimated fetal weight vs. actual birth weight	0.409	<0.001	100

DISCUSSION

In this cross-sectional observational study of women with term pregnancies, the participants were predominantly young and primiparous, with most being gravida 1–2. The majority were between 37 and 40 weeks of gestation, and most fetuses had sonographically estimated fetal weights of 2.5–3.49 kg. The mean sonographically estimated fetal weight was slightly lower than the mean actual birth weight, with a statistically significant difference between the two measurements, while a significant positive correlation was observed between sonographically estimated fetal weight and actual birth weight.

The baseline characteristics of the present study population were comparable to those reported in previous studies involving term pregnancies. Sharma et al., in their study of 110 women with singleton term pregnancies, reported a mean maternal age of 25.1 ± 4.3 years, which was closely comparable to the mean age of 24.74 ± 4.53 years observed in the present study [17]. They also reported that 64 of 110 women were gravida 1, indicating a predominance of women in their first pregnancy, which was consistent with the present finding that 68.0% of participants were gravida 1–2 [17]. Similarly, Konwar et al., in their study evaluating sonographic fetal-weight estimation against actual birth weight, assessed a relatively young reproductive-age population, which was comparable to the present study population with an age range of 18–38 years [18]. These similarities indicate that the demographic characteristics of the present participants were broadly comparable to those of previous studies investigating sonographic fetal-weight estimation in term pregnancies.

The gestational age distribution in the present study showed a predominance of participants within the early-to-mid term period, which was broadly comparable with the findings of Pavithra et al. In their study of 70 term singleton pregnancies, 25 (36%) women were at 37–38 weeks, 41 (58%) were at 39–40 weeks, and 4 (6%) were beyond 40 weeks, with 94% of participants between 37 and 40 weeks [19]. In comparison, 76.0% of participants in the present study were between 37 and 40 weeks, while 8.0% were at 41 weeks. However, the largest proportion in the present study was observed at 38 weeks (32.0%), whereas Pavithra et al. reported the highest proportion at 39–40 weeks (58%) [19]. Thus, although both studies included predominantly term pregnancies, the present study showed a relatively earlier distribution of gestational age.

The distribution of sonographically estimated fetal weight in the present study was broadly comparable with the findings of Nurzadeh et al. and Eze et al., who also reported that most fetuses had estimated weights within the 3.0–3.99 kg range. Nurzadeh et al., in a study of 300 pregnant women at ≥37 weeks, found that 33.6% of fetuses had an estimated weight of 3.5–3.99 kg and 30.6% had 3.0–3.49 kg, indicating that a substantial proportion had estimated fetal weights in the 3.0–3.49 kg range [20]. Similarly, Eze et al., in 282 term pregnancies, reported 30.9% of fetuses with an estimated weight of 3.0–3.49 kg and 33.7% with 3.5–3.99 kg, with 64.6% falling within the 3.0–3.99 kg range [21]. In the present study, the largest proportion of fetuses (46.0%) had an estimated weight of 3.0–3.49 kg, followed by 36.0% in the 2.5–2.99 kg category, while 16.0% had an estimated weight >3.5 kg. The mean sonographically estimated fetal weight was 3.06 ± 0.42 kg, which was also comparable to the mean values reported by Nurzadeh et al. [20]. Overall, the predominance of estimated fetal weights around 3.0–3.5 kg in the present study is consistent with the distribution reported in these previous studies.

The distribution of actual birth weight in the present study was broadly comparable with findings from previous studies of term singleton pregnancies. Chen et al., in a study of 4,262 singleton full-term births, reported a mean birth weight of 3.16 ± 0.38 kg, which was closely comparable to the mean birth weight of 3.11 ± 0.16 kg observed in the present study [22]. Similarly, Mettananda et al., in a prospective study of 8,053 singleton term deliveries, reported mean birth weights of 2.73 ± 0.43 kg at 37 weeks, 2.87 ± 0.38 kg at 38 weeks, 3.01 ± 0.38 kg at 39 weeks, and 3.08 ± 0.35 kg at 40 weeks, showing a gradual increase in birth weight with advancing gestational age [23]. In the present study, the largest proportion of newborns (40.0%) had a birth weight of 3.0–3.49 kg, while 22.0% weighed <2.5 kg, 20.0% weighed 2.5–2.99 kg, and 18.0% weighed >3.5 kg. These findings indicate that the birth-weight pattern observed in the present study falls within the range reported in other populations of term pregnancies.

The comparison between sonographically estimated fetal weight and actual birth weight in the present study showed findings broadly consistent with previous studies, although the statistical significance differed. Njoku et al., in 200 term pregnancies, reported a mean ultrasound-estimated fetal weight of 3.141 ± 0.441 kg and a mean actual birth weight of 3.242 ± 0.508 kg, with the ultrasound estimate being approximately 101 g lower than the actual birth weight; however, this difference was not statistically significant (t = 2.259, p = 0.122) [24]. Similarly, Bakshi et al., in a study of 75 term pregnancies at Dhaka National Medical College, reported a mean actual birth weight of 2.990 ± 0.409 kg and found that ultrasonography tended to underestimate birth weight overall, although the differences in accuracy measures were not statistically significant [25]. In the present study, the mean sonographically estimated fetal weight was 3.06 ± 0.42 kg, compared with 3.11 ± 0.16 kg for actual birth weight, with the estimated weight being approximately 50 g lower. However, unlike these previous studies, the difference between the two measurements in the present study was statistically significant (t = 2.21, p = 0.028). Thus, the direction of difference was similar across the studies, with sonographic estimation tending to be lower than actual birth weight, while the statistical significance of this difference varied.

The correlation between sonographically estimated fetal weight and actual birth weight in the present study was consistent with the findings of Sharma et al., who prospectively studied 110 women with singleton term pregnancies and reported a significant positive correlation between sonographic EFW and actual birth weight (Pearson's r = 0.58, p < 0.001) [17]. In their study, the mean EFW was 3120.8 ± 349.4 g, compared with a mean actual birth weight of 3088.2 ± 404.5 g, with ultrasound overestimating birth weight by

approximately 32.6 g [17]. Similarly, the present study demonstrated a statistically significant positive correlation between EFW and actual birth weight ($r = 0.409$, $p < 0.001$), although the strength of correlation was lower than that reported by Sharma et al. The findings of both studies therefore demonstrate that higher sonographically estimated fetal weights tend to correspond with higher actual birth weights among term pregnancies.

LIMITATIONS

The study had a few limitations:

- The study had a short study period, limiting the duration of participant follow-up.
- The relatively small sample size may limit the generalizability of the findings.
- Most women presented for their first ANC visit at term gestation, limiting assessment across the antenatal period.
- Some participants provided incomplete or potentially inaccurate information regarding previous ANC visits.
- The study setting and participant characteristics may limit the generalizability of the findings to other populations.
- Larger, multicenter studies with longer follow-up and more comprehensive ANC data are needed to validate the findings.

CONCLUSION

Accurate assessment of fetal weight is an important component of obstetric care and delivery planning. The present study demonstrated that sonographically estimated fetal weight and actual birth weight showed broadly similar patterns among term pregnancies, with a significant positive relationship between the two measurements. However, sonographic estimation showed a small but statistically significant difference from actual birth weight, indicating that ultrasound provides a useful approximation of fetal weight while some variation from the actual birth weight may occur.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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