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ORIGINAL ARTICLE

Correlation of Sonographically Estimated Fetal Weight with Actual Birth Weight in Term Pregnancy

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ABSTRACT

Background: *Accurate fetal-weight assessment is important for obstetric management, as both low and excessive fetal weight are associated with adverse perinatal outcomes. Sonographic estimation is widely used for antenatal fetal-weight assessment, but its accuracy may vary with maternal, fetal, and other factors. Therefore, comparing sonographically estimated fetal weight with actual birth weight is clinically relevant, particularly in term pregnancies.* ***Objective:*** *The aim of the study was to determine the correlation between sonographically estimated fetal weight and actual birth weight in 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 17th March 2018 to 16th September 2018 among women with term singleton pregnancies. Maternal characteristics, sonographically estimated fetal weight, and actual birth weight were recorded. Data were analyzed using SPSS version 22.0, with Pearson's correlation used to assess the relationship between estimated and actual birth weight.* ***Results:*** *Among 100 term pregnancies, the mean maternal age was 24.74 ± 4.53 years, with most participants aged 18–25 years (56.0%), gravida 1–2 (68.0%), and primipara (74.0%). The most common gestational age was 38 weeks (32.0%). Mean sonographic EFW was 3.06 ± 0.42 kg and actual birth weight was 3.11 ± 0.16 kg. A significant positive correlation was observed between EFW and actual birth weight ($r = 0.409$, $p < 0.001$).* ***Conclusion:*** *Sonographically estimated fetal weight showed a significant positive correlation with actual birth weight in term pregnancies.*

Key words: *Sonographic Fetal Weight, Actual Birth Weight, Term Pregnancy, Ultrasonography, Fetal Weight Estimation*

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INTRODUCTION

Birth weight represents the combined effects of fetal growth and the duration of gestation, with each of these factors contributing differently to the eventual outcomes and sequelae. Fetal weight is an important determinant of pregnancy outcome and is also closely associated with infant mortality during the first year of life [1]. Both low birth weight and excessive fetal weight are associated with an increased likelihood of complications in the newborn during labor and the puerperium [2]. Low birth weight may occur in association with preterm delivery, intrauterine growth restriction (IUGR), or both, whereas excessive fetal weight or macrosomia may lead to complications such as shoulder dystocia, brachial plexus injuries, bony injuries, and intrapartum asphyxia [3]. Therefore, determination of birthweight during the antenatal period has considerable clinical importance [4].

Antenatal care plays an important role in reducing maternal and infant morbidity and mortality, and prenatal fetal weight estimation is considered an important component of routine antenatal care [1]. As part of standard obstetric care, prenatal fetal weight estimation may help clinicians anticipate preterm deliveries and determine the most appropriate route of delivery [2]. Accurate assessment of fetal weight is therefore particularly important in the management of labour and delivery [2]. Fetal weight can be estimated through both clinical methods and ultrasound assessment [5]. Ultrasonography has become a widely used method for prenatal estimation of fetal weight. Sonographic estimation of fetal weight may be performed using individual fetal biometric parameters, including the Biparietal diameter (BPD), Abdominal Circumference (AC), Femur Length (FL), and Head Circumference (HC), or by combining several of these parameters [6]. Ultrasonographic measurements of the biparietal diameter (BPD), abdominal circumference (AC), femur length (FL), and head circumference (HC), together with established formulas such as those of Shepard or Hadlock, are also used for fetal weight estimation [7]. Sub-

sequent studies have indicated that incorporating multiple fetal parameters can improve the accuracy of fetal weight estimation.

With the introduction of sonography for prenatal fetal weight estimation, it was considered superior to several clinical methods of estimating fetal weight, as commonly used approaches such as the tactile method, assessment of clinical risk factors, and birth weight estimation formulas may show considerable variation [8]. The proposed advantage of sonographically estimated fetal weight over clinical methods is that sonographic assessment is based on objective intrauterine linear and/or planar measurements of fetal parameters, thereby reducing the subjectivity associated with clinical estimation [9]. However, sonographic fetal weight prediction is not without limitations, and several investigators have described it as complicated and laborious, with its accuracy potentially being influenced by maternal characteristics such as age and weight, an anteriorly located placenta, oligohydramnios, and racial factors [10,11]. Differences related to racial variation may also affect sonographic estimation of fetal weight, and it has therefore been suggested that fetal weight prediction models developed from one ethnic population may produce inaccurate estimations when applied to another locality without prior validation of their clinical applicability.

Sonographic fetal weight estimation is an important component of antenatal care and may contribute to decisions regarding the timing and mode of pregnancy termination. Prenatal fetal weight prediction can also assist in identifying SGA and LGA babies, which is important for appropriate perinatal management [12]. Similarly, prenatal fetal weight prediction may aid in identifying intra-uterine growth restriction (IUGR), which is relevant to planning the perinatal management of affected babies [2]. Therefore, evaluating the relationship between sonographically estimated fetal weight and actual birth weight is clinically relevant, particularly in term pregnancies where delivery is imminent. The objective of this study was to determine the correlation between sonographically estimated fetal weight and actual birth weight in term pregnancies.

OBJECTIVE

To determine the correlation between sonographically estimated fetal weight and actual birth weight in term pregnancies.

METHODS & 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 17th March 2018 to 16th 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 ultrasonographic assessment, and subsequently delivered their babies in the department during the study period.

Inclusion Criteria

- Pregnant women with a gestational age of 37–41 weeks and a known LMP.
- Reliable date of the last menstrual period.
- Regular menstrual cycles.
- Close correlation between menstrual age and clinically assessed gestational age.
- Singleton pregnancy.
- Live-born infants without congenital malformations or hydrops.

Exclusion Criteria

- Preterm pregnancy.
- Multiple pregnancy.
- Advanced labour.
- Antenatally diagnosed 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 hemorrhage.
- Unstable maternal conditions, such as eclampsia.

Data Collection

Data were collected using a pre-designed and structured questionnaire. Information regarding maternal age, gravida, parity, and gestational age was recorded. Sonographically estimated fetal weight was assessed by ultrasonography, and the actual birth weight was recorded following delivery. The collected data were checked for completeness and consistency before being edited, coded, and entered for statistical analysis.

Statistical Analysis

Data were analyzed using SPSS version 22.0. Quantitative variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequency and percentage. Pearson's correlation coefficient was used to assess the correlation between sonographically estimated fetal weight and actual birth weight. A p value of <0.05 was considered statistically significant.

Quality Assurance

A work manual was prepared to ensure standardization of the data collection process. A structured questionnaire was developed and pretested before commencement of data collection to ensure that the questions were clear, understandable, and appropriately answered by the participants.

Ethical Considerations

The study involved minimal physical, psychological, social, and legal risk to the participants. Appropriate safety measures were maintained throughout history taking, physical examination, and investigations. Access to study data was restricted to the research personnel. Permission to conduct the study was obtained from the appropriate authority of Shaheed Suhrawardy Medical College Hospital. The study was conducted in accordance with the Declaration of Helsinki (1964). Participants were informed about the study objectives and procedures and their right to withdraw from the study at any time without affecting their standard care. Written informed consent was obtained voluntarily from all participants.

RESULTS

Figure 1 presents the age distribution of the study participants. The majority of the participants (56.0%) were aged 18–25 years, followed by 38.0% who were aged 26–30 years and 6.0% who were aged >30 years. The mean age of the participants was 24.74 ± 4.53 years, with an age range of 18–38 years.

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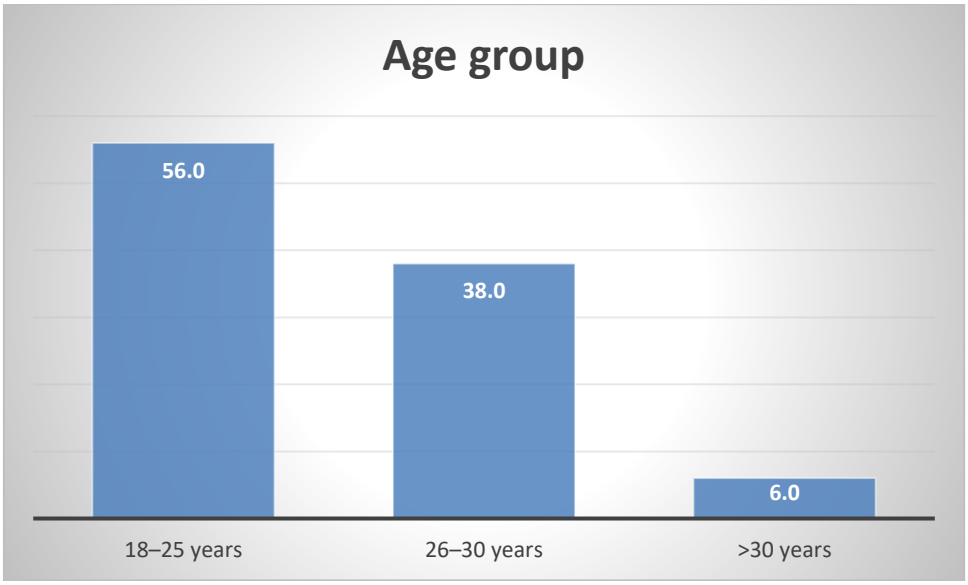


Figure 1: Age Distribution of the Study Participants (*n* = 100)

Table I presents the obstetric characteristics of the study participants according to gravida and parity. Most participants (68.0%) were gravida 1–2, while 32.0% were gravida ≥3. The mean gravida was 2.10 ± 1.07. Regarding parity, the majority of participants were primipara (74.0%), while 26.0% were multipara.

Table I: Distribution of the Study Participants by Gravida and Parity (*n* = 100)

Category	Variable	Frequency (n)	Percentage (%)
Gravida	1–2	68	68.0
	≥3	32	32.0
	Mean ± SD	2.10 ± 1.07	
Parity	Primipara	74	74.0
	Multipara	26	26.0

Figure 2 presents the distribution of the study participants according to gestational week. The highest proportion of participants (32.0%) were at 38 weeks of gestation, followed by 40 weeks (24.0%), 39 weeks (22.0%), 37 weeks (14.0%), and 41 weeks (8.0%).

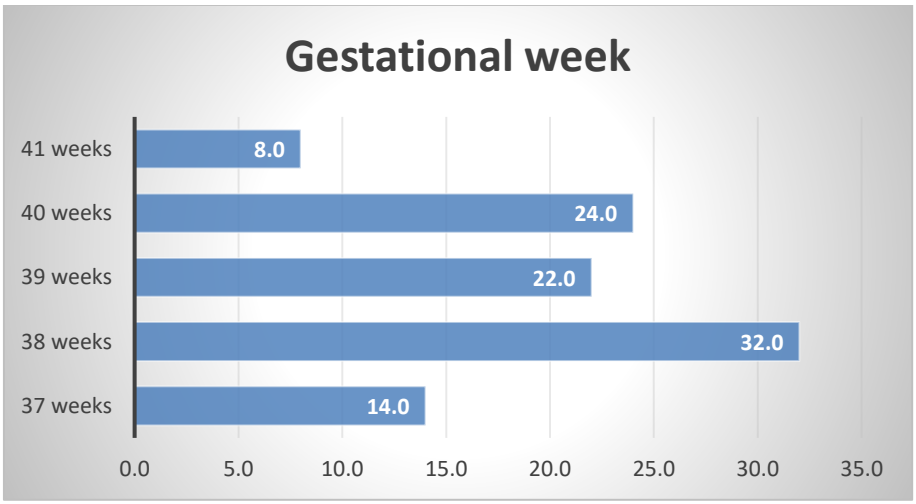


Figure 2: Distribution of the Study Participants by Gestational Week (*n* = 100)

Table II presents the distribution of sonographically estimated fetal weight and actual birth weight among the study participants. The largest proportion of fetuses had a sonographically estimated fetal weight of 3.0–3.49 kg (46.0%), while 40.0% of newborns had an actual birth weight of 3.0–3.49 kg. The mean sonographically estimated fetal weight was 3.06 ± 0.42 kg, compared with 3.11 ± 0.16 kg for actual birth weight.

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Table II: Distribution of Sonographically Estimated Fetal Weight and Actual Birth Weight (*n* = 100)

Category	Variable	Frequency (n)	Percentage (%)
Sonographically estimated fetal weight	<2.5 kg	2	2.0
	2.5–2.99 kg	36	36.0
	3.0–3.49 kg	46	46.0
	>3.5 kg	16	16.0
	Mean ± SD	3.06 ± 0.42 kg	
Actual birth weight	<2.5 kg	22	22.0
	2.5–2.99 kg	20	20.0
	3.0–3.49 kg	40	40.0
	>3.5 kg	18	18.0
	Mean ± SD	3.11 ± 0.16 kg	

Table III presents the correlation between sonographically estimated fetal weight and actual birth weight. Pearson's correlation analysis demonstrated a statistically significant positive correlation between sonographically estimated fetal weight and actual birth weight (r = 0.409, p < 0.001).

Table III: Correlation Between Sonographically Estimated Fetal Weight and Actual Birth Weight (*n* = 100)

Variables	Statistics	Ultrasonographic estimated fetal weight (kg)	Actual birth weight (kg)
Ultrasonographic estimated fetal weight	r value	1	0.409
	p value	—	<0.001
	N	100	100
Actual birth weight	r value	0.409	1
	p value	<0.001	—
	N	100	100

DISCUSSION

In this cross-sectional observational study of women with term singleton pregnancies, most participants were young and primiparous, with late-term gestation being the predominant gestational age. Sonographically estimated fetal weight showed a significant positive correlation with actual birth weight, indicating a consistent relationship between the estimated and measured fetal weights.

For the age distribution, the findings of the present study were comparable to those reported by Saini et al., who studied 277 women undergoing third-trimester fetal growth assessment and reported a mean maternal age of 25.49 ± 3.51 years. In their study, 55.6% of women were aged 18–25 years, 33.9% were aged 26–30 years, and 10.5% were aged >30 years [13]. Similarly, in the present study, 56.0% of participants were aged 18–25 years, 38.0% were aged 26–30 years, and 6.0% were aged >30 years, with a mean age of 24.74 ± 4.53 years. Thus, both studies demonstrated a predominance of women in the younger reproductive-age groups, with broadly comparable mean maternal ages and age distributions.

Regarding obstetric characteristics, the findings of the present study were comparable to those reported by Amrita et al., who conducted a prospective observational study among 100 singleton pregnancies at term (37–42 weeks) and compared clinical and sonographic fetal-weight estimation with actual birth weight. They reported that 55% of the participants were primigravida and 45% were multigravida [14]. In the present study, 68.0% of participants were gravida 1–2 and 32.0% were gravida ≥3, with a mean gravida of 2.10 ± 1.07, while 74.0% were primipara and 26.0% were multipara. Thus, both studies demonstrated a predominance of women with lower gravidity and parity among term pregnancies undergoing fetal-weight assessment, although the proportion of primiparous women was higher in the present study.

Regarding gestational age, the distribution in the present study was broadly comparable to that reported by Shapla et al., who studied 100 pregnant women at term (37–40 weeks) and compared sonographic estimated fetal weight with actual birth weight. They reported 16% of participants at 37 weeks, 26% at 38 weeks, 24% at 39 weeks, and 34% at 40 weeks [15], compared with 14%, 32%, 22%, and 24%, respectively, in the present study. The present study additionally included 8.0% of participants at 41 weeks. The mean gestational age reported by Shapla et al. was 38.76 ± 1.09 weeks, with a range of 37–40 weeks [15]. Similarly, Cheng et al., in a large retrospective cohort study of low-risk women with singleton term births, evaluated gestational age according to individual completed weeks from 37 to 41 weeks [16]. Thus, the present study's distribution across individual gestational weeks was consistent with the approach used in previous studies of term pregnancies, while showing some variation in the proportion of participants at each gestational week.

Regarding fetal weight, the findings of the present study were broadly comparable to those reported by Sherin et al., who conducted a Bangladeshi study at Khulna Medical College Hospital among 100 women at 37–41 weeks of gestation and reported a mean sonographic estimated fetal weight of 3.091 ± 0.296 kg and a mean actual birth weight of 3.155 ± 0.396 kg [17]. Similarly, in the present study, the mean sonographically estimated fetal weight was 3.06 ± 0.42 kg, while the mean actual birth weight was 3.11 ± 0.16 kg, with ultrasound slightly underestimating the actual birth weight by approximately 50 g. Poonam et al., in a prospective study of 100 term pregnancies, reported a mean actual birth weight of 2.9009 ± 0.3086 kg and a mean sonographic estimated fetal weight of 2.9470 ± 0.2860 kg, with ultrasound slightly overestimating birth weight by approximately 46 g [18]. Thus, the mean fetal-weight values in the present study were comparable to those reported in previous studies, although the direction and magnitude of the difference between sonographic estimation and actual birth weight varied across studies.

Regarding the correlation between sonographically estimated fetal weight and actual birth weight, the present study demonstrated a statistically significant positive correlation (r = 0.409, p < 0.001), indicating that higher sonographically estimated fetal weights tended to be associated with higher actual

birth weights. This finding was consistent with that of Hashim et al., who studied 74 women with term pregnancies in a rural setting in Sudan and reported significant positive correlations between estimated fetal weight and actual fetal weight using both the Hadlock formula ($r = 0.908$, $p < 0.001$) and the Shepard formula ($r = 0.781$, $p < 0.001$) [19]. Although the strength of correlation in the present study was lower than that reported by Hashim et al., both studies demonstrated a statistically significant positive relationship between sonographically estimated fetal weight and actual birth weight, supporting the observed association between the two measurements.

LIMITATIONS OF THE STUDY

The study had several limitations:

- Short study period, limiting long-term observation throughout pregnancy.
- Relatively small sample size, which may limit the generalizability of the findings.
- Most participants presented for their first antenatal care (ANC) visit at term gestation, limiting assessment of earlier ANC.
- Some participants provided incomplete or potentially inaccurate information regarding previous ANC visits.
- Larger, prospective, and more comprehensive studies are needed to further evaluate ANC and improve the prediction of birth weight, with the ultimate goal of reducing perinatal morbidity and mortality.

CONCLUSION

The study demonstrated a significant positive correlation between sonographically estimated fetal weight and actual birth weight in term pregnancies. The findings suggest that sonographic estimation of fetal weight can provide useful information for assessing fetal weight and may assist in clinical decision-making during the management of term pregnancies.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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