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Original Research Article

Exploring Symphysio-Fundal Height and Abdominal Girth in Predicting Fetal Weight: Lessons from Bugando Medical Centre, Mwanza, Tanzania

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Abstract: ***Background:*** Estimating fetal weight plays a crucial role in decision-making, particularly in high-risk pregnancies when determining the timing and method of delivery. In resource-limited settings where ultrasound availability is limited, Symphysio-Fundal Height and Abdominal Girth (clinical method) have been utilized as a substitute for predicting fetal weight. However, the accuracy of this clinical method has not been assessed locally. This study seeks to evaluate the precision of clinical method in estimating fetal weight and its correlation with the actual birth weight at Bugando Medical Centre. ***Methods:*** A hospital-based cross-sectional study was conducted in the Lake Zone area of Tanzania at Bugando Medical Centre. The study conveniently enrolled 400 mothers with singleton pregnancies who were admitted for normal vaginal delivery, elective cesarean section, or induction of labor. Fetal weight was estimated using clinical methods and compared with the birth weight at delivery. Statistical analysis was performed using SPSS version 20, employing descriptive statistics such as frequency, mean, and standard deviation. The relationship between estimated fetal weight, and birth weight were examined using the Chi-square and Pearson's correlation coefficient. A P-value of 0.05 was considered statistically significant. ***Results:*** The study participants had an average age of 29.13 years (± 5.346). Our analysis revealed that the mean estimated fetal weight slightly exceeded the actual birth weight, with values of 3495 grams and 3250 grams, respectively. Notably, this difference was statistically significant with a P-value < 0.001, indicating the clinical method's tendency to overestimate fetal weight. Furthermore, the clinical method showed a strong positive correlation with actual birth weight (correlation coefficient = 0.7309, p-value < 0.001), demonstrating its reliability in fetal weight estimation. The positive linear correlation between clinical fetal weight estimation and actual birth weight was also evident (R^2 = 0.512), reinforcing the validity of the clinical method in assessing fetal weight. ***Conclusion and Recommendation*****:** Our study highlights the clinical method's value in estimating fetal weight in low-resource settings, with significant positive correlation to actual birth weight. Addressing limitations and exploring innovations could enhance accuracy for improved maternal and fetal healthcare outcomes.

Keywords: Fetal weight, Symphysio-Fundal Height.

INTRODUCTION

The main goal of obstetrics is to ensure the delivery of a healthy baby to a healthy mother. Birth weight stands as the most critical determinant of neonatal outcome and survival [1], underscoring the significance of accurately estimating fetal weight in labor management. Such estimation aids in decision-making during labor, thereby reducing the risk of delivery complications [2]. Birth weight serves as a crucial predictive indicator of neonatal outcomes, with the typical range falling between 2500 grams and 4000 grams. Birth weights exceeding or falling below this range are linked to heightened risks of newborn complications during labor and the postpartum period [3].

Symphysio-fundal height (SFH) and abdominal girth (AG) measurements have been shown to be valuable in predicting fetal weight, particularly in low-resource settings where sophisticated methods may be

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unavailable [4]. These measurements have been found to correlate well with birth weight, making them useful for estimating fetal weight before delivery [4]. In areas where access to ultrasonography is limited, SFH and abdominal girth measurements provide an alternative, easy method for assessing fetal birth weight [5]. Additionally, SFH measurements are a reliable parameter for assessing fetal growth and screening pregnancies for intrauterine growth retardation (IUGR) [6]. However, it is important to note that while SFH and abdominal girth measurements have shown accuracy in predicting normal weight and macrosomic babies, they may be less accurate in predicting low birth weight babi es [3].

Symphysio-fundal height (SFH) and abdominal girth were assessed for fetal weight prediction at Muhimbili National Hospital in Tanzania, revealing a robust correlation with birth weight (coefficients of 0.74 and 0.69, respectively) [7]. Despite being widely used in Tanzania, symphysio-fundal height (SFH) and abdominal girth have not been thoroughly studied in other regions such as in the Lake Zone and Bugando Medical Centre. Their effectiveness may be influenced by factors like ethnicity, race, and locality, as well as maternal BMI, which can vary based on ethnicity and location [8, 9]. Hence, this study seeks to compare symphysio-fundal height (SFH) and abdominal girth for estimating fetal weight and correlating it with the newborn's actual weight at birth. This analysis aims to ascertain the reliability of this method for estimating fetal weight.

MATERIAL AND METHODS

A cross-sectional study was conducted at Bugando Medical Centre (BMC) between August 2022 and April 2023, involving the recruitment of 400 women through convenient sampling methods. BMC, situated along Lake Victoria, serves as a tertiary hospital and a teaching institution for the Catholic University of Health and Allied Health Sciences. It operates as a referral center, providing specialized healthcare services to a catchment population of approximately 21.2 million individuals from surrounding regions, as per the 2022 census [10]. BMC carries out around 5,000 deliveries annually.

Our study focused on women within the reproductive age group who met specific criteria: singleton pregnancy at term (i.e., ≥37 to 42 weeks of gestation), with intact membranes, longitudinal lie, and either admitted for elective cesarean section, induction of labor, or in the latent phase of labor, and who provided informed consent. Exclusion criteria encompassed participants with ruptured membranes, active labor (defined as ≥6 cm cervical dilatation), malpresentation (transverse lie), known intrauterine fetal demise, multiple pregnancies, uterine fibroids, fetal malformations, antepartum hemorrhage, pre-eclampsia/eclampsia, and obesity (BMI >30 kg/m²).

The procedure involved positioning patient's supine and exposing the area from the symphysis pubis to the xiphisternum. Leopold's maneuver was conducted to determine fetal presentation and lie, while fetal heart rates (FHR) were continuously monitored for viability. Measurements were meticulously taken using a non-elastic flexible tape measure, which was inverted to prevent bias. Abdominal circumference was assessed at the level of the umbilicus, and symphysio-fundal height was measured from the midpoint of the upper symphysis pubis border to the uterine fundus's highest point during relaxation. To enhance accuracy, measurements were repeated twice, and their averages were utilized to calculate estimated fetal weight (EFW) in grams, employing the formula EFW (grams) = FH × AG (in cm), where 1 cm equaled 1 g.

Following delivery, trained midwives promptly measured the birth weight of each newborn within one hour using an analog neonatal weighing scale called the Salter scale. The infants were unclothed during this process, and their weights were recorded in grams. To ensure accuracy, the weighing scale was calibrated before each measurement to prevent zero errors.

Data analysis procedure and statistical analysis

The questionnaires underwent meticulous review to ensure completeness and consistency before being entered into Excel for data processing. The cleaned dataset was then imported into SPSS version 20 for analysis. Continuous variables were summarized using mean with standard deviation, while categorical variables were summarized using frequencies and proportions. Pearson's correlation coefficient was used to determine the correlation between the clinical method and the actual birth weight. The mean birth weight and standard deviation resulting from clinical method estimations of fetal weight were calculated. Additionally, estimated fetal weight and birth weight were examined using the Chi-square and Fisher's exact tests. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Out of 450 individuals screened for eligibility, 400 were deemed suitable for inclusion in the study after meeting the specified criteria.

Social demographic characteristics of the participants

The average age of the study participants was 29.13 years $\pm$ 5.346. A majority of them, constituting 57%, had completed secondary education, while 96% were married, as illustrated in Table 1.

Table 1: Social Demographic Characteristics of the Participants

Variables	Frequency n=400	Percent (%)
Age categories		
15-24	82	20.5
25-34	250	62.5
35-44	68	17.0
Mean age	*29.13 years ± 5.346SD*	
Gestation Age(weeks)		
37-38	167	41.8
39-40	186	46.5
41-42	47	11.7
Level of education		
primary	68	17.0
Secondary	385	57.0
College/University	102	25.5
Marital Status		
Married	385	96.3
Single	12	3.0
Divorced	3	0.7
Religion		
Christian	333	83.3
Muslim	67	16.8
Occupation		
Entrepreneurship	142	35.5
Housewife	149	37.3
Peasant	11	2.8
Public servant	67	24.5

The comparison between clinical estimated fetal weight with actual birth weight

Table 2 presents a comparison of the mean birth weights obtained through two methods: the clinical method and the actual birth weight. The mean estimated fetal weight is slightly higher than the actual birth weight, with values of 3495 grams and 3250 grams, respectively. Importantly, this difference is statistically significant at a P value < 0.001.

Table 2: Comparison of clinical estimated fetal weight with actual birth weight

	Variable	Mean	SD	95 %CI	P=value
Comparison	Clinical method	3495.06	370.73	3458.62-3531.50	< 0.0001
	BIRTH WEIGHT	3250.46	453.47	3205.89-3295.04	

Correlation between clinical method of fetal weight estimation and actual birth weight

The clinical method of fetal weight assessment was positively correlated with the actual birth weight of the fetus after delivery (Correlation coefficient=0.7309) and it was statistically significant with a p-value <0.001). Clinical fetal weight estimation and actual birth weight have a positive linear correlation (R2=0.512).

The scatter diagram showing the relationship between the clinical fetal weight estimation and birth weight is in Figure 1 below.

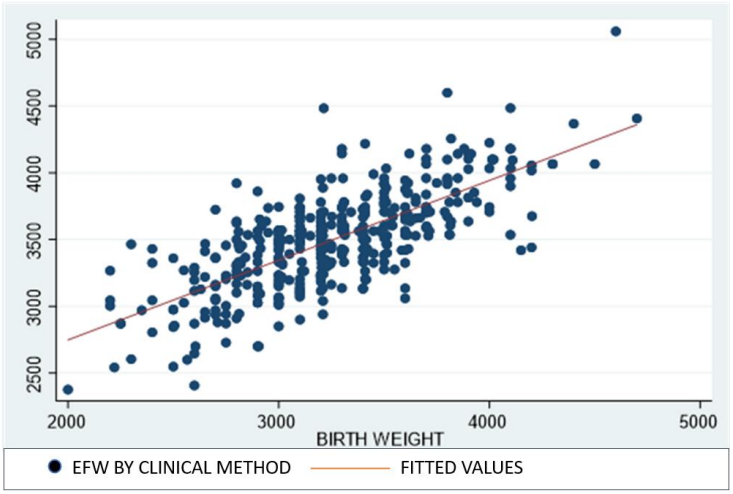

Figure 1: Scatter diagram of clinical fetal weight estimation and Birth Weight

DISCUSION

In low-resource settings, like Tanzania, accurate assessment of fetal weight during pregnancy holds paramount importance for guiding clinical decisions and optimizing maternal and fetal outcomes. Given the challenges often faced in such settings, including limited access to ultrasounds [11], relying on clinical methods for estimating fetal weight becomes imperative. In this study, we sought to evaluate the efficacy of a clinical method, combining Symphysio-Fundal Height and Abdominal Girth, in estimating fetal weight, with a specific focus on its performance in a low-resource setting.

The findings of our study revealed a statistically significant correlation between the clinical method of fetal weight estimation, combining Symphysio-Fundal Height and Abdominal Girth, and the actual birth weight of the fetus. This robust correlation, evidenced by a correlation coefficient of 0.7309 and a significant p-value of <0.001, emphasizes the effectiveness of the clinical method in providing an estimate of fetal weight. This findings are similar to the other studies conducted in various settings like Nigeria [3], India [12], Indonesia [13] and Tanzania [7].

Despite the significant correlation between the clinical method of fetal weight estimation and the actual birth weight, our study revealed a notable difference between the mean estimated fetal weight and the actual birth weight. Specifically, the mean estimated fetal weight was found to be slightly higher than the actual birth weight. This discrepancy aligns with findings from previous studies, which have similarly reported a tendency for clinical estimates to overestimate fetal weight [3, 12].

The statistical analysis of our study highlights the strength of the relationship between the clinical method of fetal weight assessment and the actual birth weight. The low p-values, coupled with the positive correlation coefficient of 0.7309, signify a strong and significant association between the two variables. This statistical significance not only reinforces the reliability of the clinical method but also suggests its validity in estimating fetal weight accurately.

Clinical Implications

The findings of our study hold significant implications for clinical practice, particularly in resource-limited settings such as Tanzania. While the clinical method demonstrates promise in estimating fetal weight, the observed tendency for slight overestimation warrants careful consideration by clinicians. It is essential for healthcare providers to be cognizant of this tendency, especially when making critical decisions regarding labor management and interventions based on estimated fetal weight.

Study Limitations

Our study highlights the effectiveness of the clinical method for estimating fetal weight in low-resource settings, despite several limitations. The sample size of 400 participants, while substantial, may limit generalizability. Convenient sampling introduces selection bias, impacting sample representativeness. Although conducted by trained nurses, inter-observer variability and measurement errors persist. Exclusion criteria, while necessary, may limit sample diversity.

CONCLUSION AND RECOMMENDATIONS

Our study highlights the utility of the clinical method in estimating fetal weight in low-resource settings, supported by a significant positive correlation with actual birth weight. Despite a tendency for slight overestimation, these findings emphasize the method's practical applicability in clinical practice. Moving forward, addressing identified limitations and exploring innovative approaches could further enhance the accuracy of fetal weight estimation, ultimately advancing maternal and fetal healthcare outcomes in resource-constrained environments.

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Authors contribution

We express deep gratitude to the dedicated team members. HB led conceptualization, validation, writing, and oversaw data management. RK contributed to writing and supervision. DM provided insightful reviews. RR aided validation and resource allocation. EN contributed substantially across multiple domains and provided continuous supervision.

Data and materials availability: The dataset used and/or analyzed in this study is accessible upon request from the corresponding author.

Privacy and Ethical Considerations

This study obtained approval from the joint review board of the Catholic University of Health and Allied Sciences and Bugando Medical Centre, with additional permission granted by hospital management. All participants provided informed consent, and data extraction and analysis strictly followed applicable guidelines and regulations. Comprehensive measures were taken to ensure robust anonymization, safeguarding confidentiality and privacy.

Consent to publish: Not applicable.

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