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ORIGINAL ARTICLE

Factors influencing intrapartum fetal weight estimation

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ABSTRACT

Objective: The aim of this study was to investigate the factors that influence intrapartum fetal weight estimation.

Material and Methods: A total of 173 pregnant women who were under follow-up at the Zeynep Kamil Maternity Hospital between May 2015 and April 2016 and who had singleton, live-term pregnancy between the gestational weeks of 37 and 42 with the head presentation were included in the study. Biometric measurements were made with ultrasonography. The amniotic fluid index (AFI) was measured and recorded. Newborn fetal weight measurements recorded in the birth registration book were compared with estimated fetal weight measurements. The effects of biometric measurements, AFI, gestational week, body mass index (BMI), engagement, and clinical experience on fetal weight estimation were compared.

Results: A positive statistically significant association at the 32.3% level was determined between the birth weight and gestational week ($p=0.001$ and $p<0.05$). A positive statistically significant association at the 21.7% level was found between birth weight and BMI ($p=0.004$ and $p<0.05$). No statistically significant association was found between birth weight and BMI according to the presence of engagement ($p=0.391$ and $p>0.05$). When the professional seniority between physicians was evaluated, the rate of deviation from fetal weight was estimated to be 8.7%, and the difference was not found to be statistically significant ($p>0.05$).

Conclusion: Gestational week and BMI were determined to be significant for deviation from estimated fetal weight and professional seniority differences; engagement and AFI were determined to be ineffective.

Keywords: Estimated fetal weight, ultrasound, postpartum weight, professional seniority difference.

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INTRODUCTION

Intrapartum fetal weight estimation is very important for making a decision regarding the delivery type and the prevention of potential obstetric complications. Fetal weight estimation is made based on fetal biometric measurements such as biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC), and femur length (FL). These measurements are used in various formulas and fetal weight estimation is made. Fetal weight estimation is particularly important for the detection of fetuses with macrosomia and fetal growth restriction.[1] Through fetal weight estimation, complications such as perineal lacerations, sphincter injury, uterine atony, and shoulder dystocia that are encountered in vaginal delivery of macrosomic fetuses may be prevented. Detection of fetuses with fetal growth restrictions reduces fetal morbidity and mortality through rescheduling delivery time and paying more attention to fetal distress.[2,3]

An ample number of formulas are used for fetal weight estimation. These formulas are created based on regional ethnicity, mean birth weight, and fetal measurements. In many studies, a higher than 14% difference in estimated fetal weight at a 95% confidence interval is evaluated as an erroneous measurement. This corresponds to approximately 400 g at term.[1] INTERGROWTH 21 and Hadlock are the most commonly used formulas. Although both formulas are used worldwide, there are studies indicating the superiority of Hadlock.[4,5]

Many factors including the experience of the physician who performs the ultrasound examination, maternal weight, amniotic fluid index (AFI), and engagement level influence the fetal weight measurement. Engagement of the fetal head and reduced AFI may make measurement difficult.[6]

In the present study, we have investigated the factors that affect fetal weight estimation.

MATERIAL AND METHODS

The present study was conducted at the delivery room and the obstetric emergency outpatient clinic between May 2015 and April 2016. Ethics committee approval was obtained from the Zeynep Kamil Maternity Hospital (date: April 10, 2015; number: 41). The study was cross-sectional. A total of 173 women who had singleton pregnancies over a gestational age of 37 weeks were included in the study. Women who had multiple pregnancies, malpresentation, fetal anomaly, and uterine anomaly were excluded. Body mass index was calculated for all women. Pregnant women who had been admitted to the obstetric emergency unit and hospitalized due to indications including pain, amniotic fluid discharge, and postmaturation underwent ultrasound examination for measurements of AFI, BPD, HC, AC, and FL by the junior resident using GE Logiq 200, and fetal weight estimation was made with the Hadlock formula. AFI was measured in four quadrants and the total amount was recorded.

The presenting part of the fetus entering the maternal pelvis to a level below the plane of the pelvic inlet was considered engaged.

For women who were hospitalized in the delivery room, BPD, HC, AC, FL, and AFI measurements were made again by the senior resident using the same ultrasound device, and fetal weight estimation was made with the Hadlock formula.

Table 1: Correlations of birth weight, gestational week, and BMI

	Birth weight
Gestational week	
r	0.323
p	0.001*
BMI	
r	0.217
p	0.004*

Pearson's correlation analysis was performed. BMI: Body mass index; *: P<0.05.

Table 2: Correlations between birth weight and sum of the first and second AFI measurements

	Birth weight
AFI first measurement total	
r	0.077
p	0.317
AFI second measurement total	
r	0.141
p	0.063

Pearson's correlation analysis was performed. AFI: Amniotic fluid index.

Statistical Analyses

The data were evaluated with the IBM SPSS Statistics 22 (IBM SPSS, Turkey) statistical package program. When evaluating the data, the conformity to normal distribution was evaluated with the Shapiro–Wilk test. Student's t-test was used for the comparison of two groups of normally distributed quantitative data. The associations between parameters were evaluated with Pearson's correlation analysis. The intraclass correlation coefficient was estimated for the assessment of the conformity between junior and senior residents. Qualitative data were evaluated with McNemar's test. A p level less than 0.05 was accepted as statistically significant.

RESULTS

The study was conducted with 173 pregnant women who had singleton, live pregnancies over the gestational age of 37 weeks between May 01, 2015, and April 30, 2016.

There was a positive and statistically significant association at the 32.3% level between birth weight and week (Table 1; p=0.001 and p<0.05) (Fig. 1).

There was a positive and statistically significant association at the 21.7% level between birth weight and BMI (p=0.004 and p<0.05) (Fig. 2).

Table 3: Correlations of birth weight and alteration parameters of the first and second estimated fetal weight measurements

	Birth weight
Percent alteration of EFW first measurement	
r	-0.487
p	0.001*
Percent alteration of EFW second measurement	
r	-0.443
p	0.001*

Pearson's correlation analysis was performed. EFW: Estimated fetal weight; *: P<0.05.

Table 4: Birth weight according to the presence of engagement

	Birth weight
Engagement	
Yes (n=9)	3382.22±249.99
No (n=164)	3519.12±472.9
p	0.391

Student's t-test was performed.

There was no statistically significant relationship between birth weight and the sum of the first and second AFI measurements (Table 2; p>0.05).

There was a positive and statistically significant relationship between the birth weight and the estimated fetal weight first measurement levels at the 78.3% level (Table 3; p=0.001 and p<0.05). There was a positive and statistically significant relationship between the birth weight and the estimated fetal weight second measurement levels at 75.8% level (Table 3; p=0.001 and p<0.05).

For junior residents, there was a reverse and statistically significant relationship at the 48.7% level between the birth weight and the deviation of fetal weight from birth weight (Table 3; p=0.001 and p<0.05) (Fig. 3).

For senior residents, there was a reverse and statistically significant relationship at the 44.3% level between the birth weight and the deviation of fetal weight from birth weight (Table 3; p=0.001 and p<0.05) (Fig. 4).

There was no statistically significant difference between the birth weights of the babies according to the presence of engagement (Table 4; p=0.391 and p>0.05).

The estimated fetal weight measurements of junior residents varied between 2709 and 4872 g (mean 3640.22±428.56). The estimated fetal weight measurements of senior residents varied between 2306 and 4730 g (mean 3549.14±431.41). There was 80.6% conformity between junior and senior residents with regard to the estimated fetal weight measurement (Table 5; p=0.001 and p<0.05).

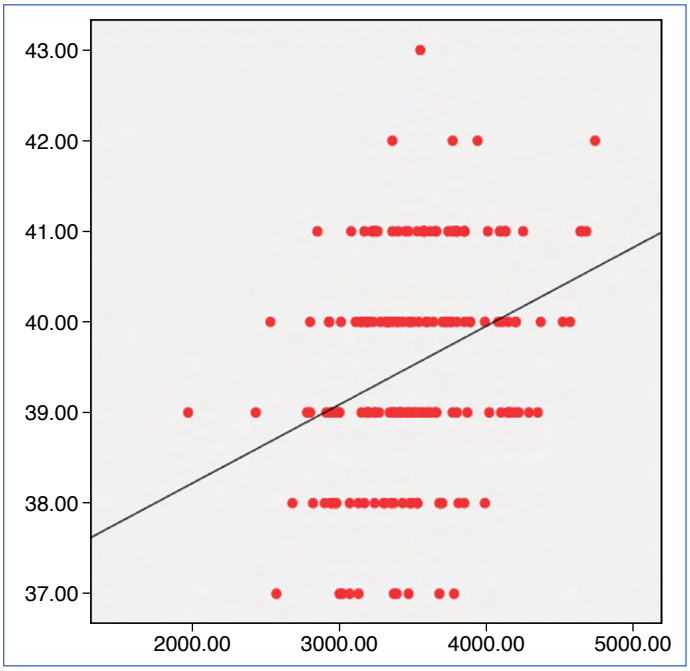

Figure 1: Gestational week and birth weight graphic.

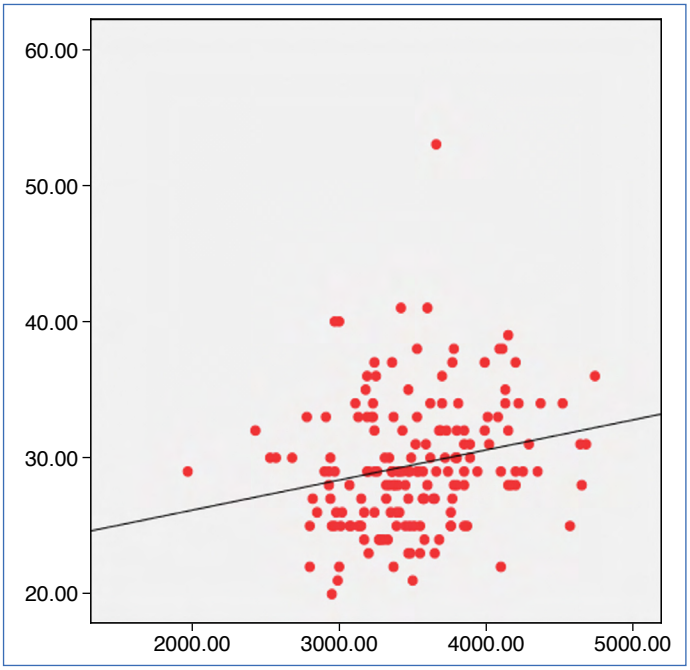

Figure 2: Body mass index and birth weight graphic.

The rate of higher than ±14% deviation in the measurements of both junior and senior residents was 8.7%, and the difference was not statistically significant (Table 6; p>0.05).

DISCUSSION

Ultrasound examination of the intrapartum patient has some difficulties. Engagement of the fetus, reduced AFI, experience of the clinician, and the body mass index of the mother may influence the es-

Table 5: Conformity between estimated fetal weight measurements of junior and senior residents

	EFW (senior resident–junior residents)
Intraclass correlation coefficient	0.806
95% confidence interval	0.747–0.853
p	0.001*

EFW: Estimated fetal weight; *: P<0.05.

Table 6: Deviation percentage of estimated fetal weight from birth weight in measurements of senior and junior residents

	Senior residents		Junior residents	
	n	%	n	%
<15%	158	91.3	158	91.3
≥15%	15	8.7	15	8.7

McNemar's test was performed.

timated fetal weight. The errors in the estimation of fetal weight may lead to increased morbidity and mortality in fetuses with fetal growth restriction and macrosomia. Complication rates decrease as the gap between the estimated fetal weight and birth weight decreases.[1]

In our study, no statistically significant difference was observed between the estimated weight and birth weight in any of the cases.

The estimated fetal weight increased as the gestational week increased, similar to the literature pregnancy is a dynamic process, EFW increases with increasing gestational week.[6]

In the study of Chauhan et al.,[7] fetal weight estimation in term pregnancies was made successfully by 65% of the specialists and 57% of the residents, and no statistically significant difference was found between the two groups. In our study, we also determined that professional seniority did not have an effect on intrapartum fetal weight estimation.

In recent studies, the margin of error in the estimated fetal weight made by ultrasonography after 2 years of experience was found to be less than 10% was 74%, and this rate was calculated as 49% in the group with less than 6 months of experience. Effective and accurate ultrasonography training increases the EFW estimation. Accurate estimation of birth weight is important for the correct management of patients.[8] In the study of Krispin et al.[9] in 2020, incorrect estimation of birth weight increases neonatal complications and neonatal intensive care admission rates.

Similar to our study, no correlation was found between the AFI and the estimated fetal weight in the literature.[10] In a study conducted in 2019, oligohydramnios has been found to have no effect on the calculation of estimated fetal weight.[11]

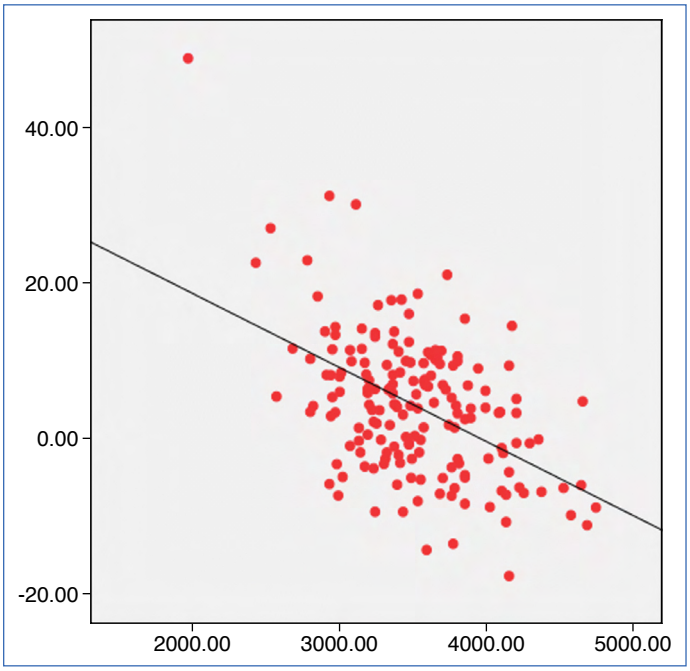

Figure 3: Deviation estimated fetal weight and birth weight for junior residents.

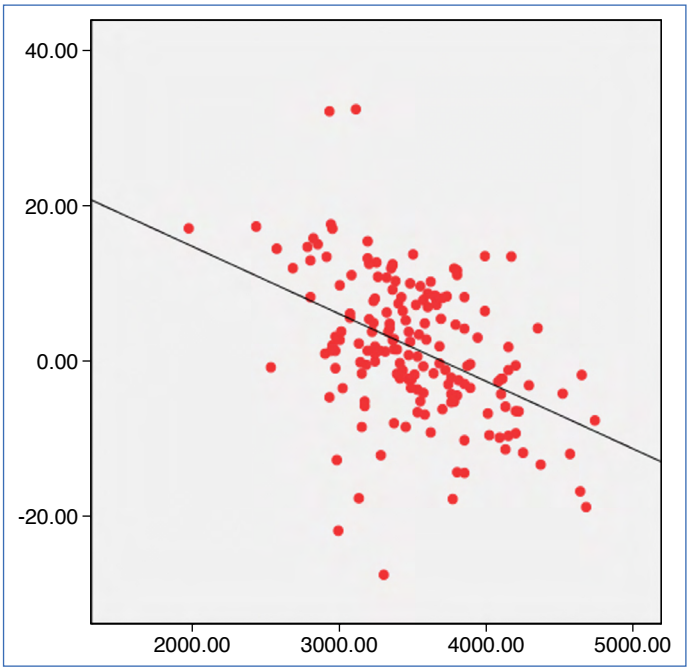

Figure 4: Deviation estimated fetal weight and birth weight for senior residents.

In the retrospective study of Gonzalez et al.,[12] the estimated fetal weight and birth weight were found to increase as the BMI increased, consistent with the results of our study. High BMI alone is not effective in determining EFW, but the margin of error in EFW increases in pregnant women weighing more than 120 kg, especially if adipose tissue is concentrated in the abdominal region.[13]

In conclusion, gestational week and BMI were determined to be significant for deviation from the estimated fetal weight, while professional seniority, engagement, and AFI were not found to be effective. Correctly estimating the fetal weight during pregnancy and intrapartum, being aware of the predictable risks of the fetuses with intrauterine growth retardation, and taking required measures will contribute to determining the delivery type. Maternal and fetal morbidity and mortality will decrease through correct management of labor of risky groups. The lack of difference between the EFW estimates of the physicians working in our center is due to the fact that they work in a busy obstetrics clinic and are well trained.

Statement

Ethics Committee Approval: The Zeynep Kamil Maternity and Children's Training and Research Hospital Clinical Research Ethics Committee granted approval for this study (date: 10.04.2015, number: 41).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – MK; Design – EÖ; Supervision – EÖ; Resource – ZB; Materials – ZB; Data Collection and/or Processing – MK, GÜ; Analysis and/or Interpretation – ZB, GÜ; Literature Search – MK; Writing – ZB; Critical Reviews – GÜ.

Conflict of Interest: The authors have no conflict of interest to declare.

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