



Correlation of fetal weight by clinical method and ultrasonography in 3rd trimester of pregnancy

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ABSTRACT

Background: In Indian antenatal scenario, fetal weight is very important to predict as extremes of both sides needs very careful management. Though ultrasound is widely used and accepted method for the birth weight estimation during pregnancy, in very remote areas yet there is limited availability and accessibility. There is need of data to judge accuracy of clinical methods for fetal birth weight estimation in 3rd trimester. **Objective:** To identify, analyze and correlate the clinical methods with ultrasound for estimation of fetal birth weight in 3rd trimester and to judge the accuracy of clinical methods for estimation as both extremes of fetal birth weight there is need of timely treatment and mode of management in 3rd trimesters. **Materials and Methods:** This study include evaluation of about 200 pregnant women who came for consultation in 3rd trimester during the study period February 2023 to April 2023 in Dhiraj Hospital, Pipariya. Estimation of fetal weight is done by clinical method - dare's formula method as well fetal weight estimation by ultrasound was recorded. Correlation between both methods in 3rd trimesters for fetal weight estimation was done and evaluated. **Results:** In more than 85 % of patients Clinical and Ultrasonography estimates strongly correlate with actual birth weight. However, weight estimation by ultrasound comes out to be more accurate than the clinical methods. Clinical method estimation only marginally lacks behind in accuracy when compared to actual birth weight of neonate. **Conclusions:** It can be postulated that the results of the present study favor ultrasound to be more accurate than the clinical methods, but clinical methods are better in terms of availability and cost effectiveness and ease of use and only marginally lack to be as accurate as usg.

Keywords: Low Birth Weight, Birth weight, Dare's method, Hadlock formula, Clinical method, Fetal weight Estimation, Ultrasonography.

Abbreviations: LBW= Low Birth Weight, USG= Ultrasonography.

I. INTRODUCTION

The purpose of this study is to compare the two methods for the Estimation of fetal weight as to decide which can be more reliable and easy to use and implement as well if clinical method is almost same or minimally less specific then ultrasound method even in peripheral areas where usg machine are not available, dependency of clinical method for prediction of fetal birth so that more caution or intensity of management of anemia can be weighed upon in particular trimesters.

Estimation of fetal weight is vital at the term or late third trimester end of pregnancy, for planning mode of delivery as well the perinatal complications are higher in cases where the birth weight is at either end of the extremes. During routine appointments, fetal weight estimates can influence the decisions about the mode of delivery and the timing of labor induction. Accurate estimates are very much useful as any detected abnormality in fetal growth may be associated with many perinatal and even maternal risk.

II. AIM AND OBJECTIVES

Our study aimed to correlate clinical methods and USG in late 3rd trimester for estimation of fetal weight and to evaluate the ease and specificity and usefulness so that timely plan of mode of delivery and timing of termination of pregnancy can be determined as needed.

III. MATERIAL AND METHOD

The study was conducted in Obstetrics & Gynec department of Dheeraj Hospital, Smt. B. K. Shah Medical Institute & Research Center, Sumandeep Vidhyapeeth, Piparia, Vadodara, Gujarat, India a tertiary care hospital in a rural area from February 2023 to April 2023. About 200 Pregnant women who came for consultation in late 3rd trimester during the study period were included in the study. This one is a study in which mothers eligible and not falling in any of the exclusion criteria only were included in this study after consent when they came for consultation in third trimester. First by clinical methods fetal weight was estimated and registered. From Ultrasound study report the value of fetal weight were recorded and registered. After delivery birth weight of the babies of these mothers were noted and correlated accordingly.

Inclusion Criteria

1. Singleton live fetus pregnancy in 3rd trimester
2. Estimation of fetal weight by clinical methods and Ultrasound study

Exclusion Criteria

1. Hydrops fetalis
2. Any Congenital anomaly in fetus apart from macrosomia

In our study Measurement of Clinical methods for estimation of fetal weight taken into consideration was done once only. At least one estimation must be done in the late third trimesters. Birth weight of the newborn was recorded in kilograms using a digital scale. From Ultrasound study report the value of fetal weight were recorded and registered. Both records were not let to be known to

either side to keep double blind study. Then rest of the management was as per the standards practiced in antenatal care.

Clinical methods

In the Late third trimester Patient to be in supine position and the uterine fundal height was measured using a measuring tape starting from the highest point on the uterine fundus at top and bottom upto the midpoint of the upper border of the symphysis pubis. using this approach measurement was made 3 times and then the mean of all the 3 readings was then obtained to the nearest centimeter to avoid any possible bias.

Now we applied the dare's method to calculate birth weight.

Dare's method is Birth weight (In Grams)=Fundal height (In cm) × Abdominal girth (In cm).

After all these clinical records and measurement of estimated fetal weight by clinical method, patient was sent for obstetric Ultrasonography. In This way we had kept the study team members blinded to the details of sonographic fetal weight. The sinologist was not having any access to patient's records containing clinical measurements. Thus, the sonologist was blinded to the details of clinical fetal weight estimation.²

Ultrasonography method The radiologist who measures the fetal weight by usg was not aware of clinical fetal weight estimation. The formula for estimating fetal weight by **Usg** is Hadlock formula **method**. Actually it is devised by Hadlock on the basis of biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC), and femoral length (FL).

Hadlock3: $\text{Log}_{10}\text{BW} = 1.335 - 0.000034 (\text{AC} \times \text{FL}) + 0.00316 \times (\text{BPD}) + 0.0045 (\text{AC}) + 0.01623 (\text{FL})$.

The ultrasound machine used is real-time with abdominal sector 3.5MHz transducer.

Finally to check the accuracy of both methods birth weight after delivery was recorded in grams or kilo grams by electronic weighing machine and tabulate.

RESULTS

In this study, we had included 200 pregnant females in late third trimester. Below table 1 reflects the result of fundal height measured to implement clinical dare's method.

Table 1

Fundal height distribution among study participants. (Total 200 Mothers)

| Fundal height (cm) | Number | Percentage |
|-----------------------|-----------|------------|
| 25-30 | 112 | 56 |
| 30-35 | 88 | 39 |
| ≥35 | 10 | 5 |
| Mean height (Mean±SD) | 32.21±2.3 | |

From these results it can be postulated that 39% participants were belonged to group of 30 to 35cm fundal height and 56 % belonged to 25 to 30 cm fundal height. Mean fundal height was 29.21 cm with 2.3 SD. More percentage in lower fundal may be because of nutrition factors etc and possibility of low birth weight fetus.

Table 2
Abdominal girth distribution among study participants (n=200)

| Abdominal girth IN CM | NUMBER | PERCENTAGE |
|----------------------------------|---------------|-------------------|
| 80-90 | 112 | 56% |
| 90-100 | 72 | 36% |
| 100-110 | 16 | 8% |
| Mean Girth (Mean±SD) | 87+/- 5.4 | |

From 200 pregnant women included in the study, above table 2 reflects the result of abdominal girth measured to implement clinical dare's method.

Table 2 reveals 56 % participants were belonged to group of 80 to 90cm abdominal girth and 36 % belonged to 90 to 100cm abdominal girth. Mean abdominal girth was 87 cm with 5.4 SD.

Table 3 **Fetal weight by Clinical Method (N= 200)**

| Fetal weight by clinical examination (n=100). Fetal weight (g) | Number | Percentage |
|---|---------------|-------------------|
| < 2500 | 32 | 16 |
| 2500-3000 | 116 | 58 |
| 3000-3500 | 50 | 25 |
| >3500 | 2 | 1 |
| Mean weight (Mean±SD) | 2600.6± 408.2 | |

Table 3 shows birth weight estimated by clinical examination. Results show that 58% fetal were belonged to birth weight group of 2500 to 3000 grams, where 16% have less than 2500gram., 25% have weight in between 3000-3500..Mean birth weight measured by clinical examination was 2606.6 gm with 408.2 gm SD.

Table 4 Fetal weight by Ultrasonography (N= 200)

| Fetal Weight (g) | Number | Percentage |
|-----------------------------|--------------------|------------|
| < 2500 | 42 | 21 |
| 2500 - 3000 | 126 | 66 |
| 3000-3500 | 56 | 28 |
| > 3500 | 1 | 0.5% |
| Mean weight (Mean \pm SD) | 2780.46 +/- 437.05 | |

Table 4 shows fetal birth weight estimated by ultra-sonography. Results shows that 66% fetus were belonged to birth weight group of 2500 to 3000grams, where 21% have less than 2500gram and 28 % have weight in between 3000-3500, only one patient had more than 3500gm birth weight. Mean birth weight measure by USG was 2780.46gm with 437.05gm SD.

Table 5: Actual Birth weight of Neonate measured immediate after delivery

| Neonate Weight in gms | Number | Percentage |
|----------------------------|------------------------|------------|
| <2500 | 28 | 14 |
| 2500-3000 | 112 | 56 |
| 3000-3500 | 58 | 29 |
| >3500 | 2 | 1% |
| Mean Weight(Mean +/- SD) | 2700.18 +/- 402.10 gms | |

Table 5 shows actual birth weight measured immediate after delivery. Results show that 56% babies were belonged to birth weight group of 2500 to 3000 grams, 29% were in between 3000-3500 gms, where 14% have less than 2500gram and 1% have more than 3500gm birth weight. Actual mean birth weight was 2700.18 gm with 402.10gm SD.

IV. DISCUSSION

In this study it is revealed that there is a need to strictly keep watch on fetal birth weight in third trimester mainly to estimate both extremes of weight of the baby and to prevent its associated all complications.

Both Clinical methods and Ultrasound play a pivotal effect for estimation of birth weight and to decide plan of management if estimation of macrosomic or low birth weight fetus done.

There is correlation of Low birth weight baby and anemia in pregnant mother. In a study by Sruthy Gnanasekaran *et al*²⁵, about 85% of low birth weight babies were born to mothers with severe maternal anemia which is statistically significant. None of the mothers who didn't have maternal anemia had low birth weight babies. It was also revealed that mothers with anemia at any time during pregnancy was found to have 4.3 times higher risk of giving birth to low birth weight babies compared to non-anemic mothers. Thus there needs to be more cautious and to be more accurate for fetal birth weight estimation in anemic mother for possible lbw fetus.

In our study also, weight estimation by clinical Dare's method had good correlation with actual birth weight of neonate on scale. The correlation coefficient between clinical estimate and actual birth weight found to be statistically significant ($r=0.9$, $p<0.0001$) and by Ultrasonography it was 0.79.

In a study by Ugwu et al, it was observed strong positive correlation of actual birth weight with clinical and ultrasonographically estimated birth-weight ($r=0.71$ and $r=0.69$ respectively).¹¹ Very Similar results were also observed in the study by Njoku C et al, as correlation coefficients for the clinical and ultrasonic methods, compared to actual birth weight, were +0.74 and +0.85, respectively, and both similarly had correlated very well with the actual birth weight.⁵

In a study conducted by Shittu et al⁶ it was found that the correlation coefficient for the clinical and ultrasonic methods, compared to actual birth weight, were observed to be +0.78 and +0.74 respectively, the relationships found to be statistically significant ($p<0.001$).⁶ However in the low-birth weight ($<2,500$ gm) group, in the same study it was revealed that, both the methods systematically overestimated the actual birth weight.⁶

Our correlation coefficient for ultrasound estimation (0.76) is comparable with that of study by Uotila et al, in year 2000, in their comparison of ultrasonic estimation (0.77) with magnetic resonance imaging (0.95) in diabetic and normal pregnancy.²⁰

Thus results of the present study and of many other studies had revealed about mild supremacy of ultrasound over clinical methods at estimating fetal weight²¹. However it had been also observed that the previous studies have come to varied and different conclusions, with some studies concluding that fetal weight estimates made by usg were the most accurate²¹, other studies reporting that the accuracy of fetal weight estimation by palpation was very poor²³, and others concluding that estimates made based on palpation were as accurate as or even more accurate than ultrasound²². However, fetal weight estimates made at term or in later third trimester have been reported to be fairly inaccurate with both methods in most studies. The different approaches used in these studies, the duration between estimating the weight and the actual birth and many times subjective differences in the doctor's skill may be the cause of the differences in the results published so far.

Other studies of sonographic fetal weight estimation have observed that accuracy depended on the formula used and that estimates made between four and seven days prior to delivery were the most accurate²⁴. In our study we had included mother in later 3rd trimester. Most mother had given birth within twenty days after the fetal weight was estimated. The mean interval between fetal weight estimation and delivery was 14 days (± 1.5), which is indeed shorter compared with the what had been reported in other studies. In addition, it should be noted that some studies did not calculate fetal weight using Hadlock's formula.

Thus need of higher center referral every time for usg for estimation of fetal weight can be reduced. Thus it can be recommended that medical professionals should always use the clinical methods for estimation of fetal weight and should consider management accordingly. Also it can be postulated that

the usefulness of combining clinical fetal weight estimation with USG is more and could be useful to extremes of both sides for fetal weight.

V. CONCLUSION

Thus from this study it can be postulated that there is a vital need for a very reliable as well accurate method for fetal weight estimation. Though the results of the present study favor ultrasound is more accurate than the clinical methods, but clinical methods are very much ahead in availability and cost effectiveness and ease of use.

clinical method estimation only marginally lacks behind in accuracy then usg when compared to actual birth weight of neonate.

Estimation of fetal weight is vital at the term or third trimester end of pregnancy, for planning mode of delivery. With proper training and skill development of even MBBS doctors or Medical Officers at Primary Health Centers so that management of planning mode of delivery or timely need of termination of pregnancy can be done. Perinatal complications are higher in cases where the birth weight is at either end of the extremes. So accurate fetal weight estimates influence the decisions about the mode of delivery and the timing of labor induction and need of referral to Higher centers.

We recommend that to improve the reliability of clinical methods, future studies are needed to develop to judge the accuracy of predicting fetal weight and to explore uses of new formulae for more accuracy.

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