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Comparison of ultrasonographic estimated fetal weight and actual birth weight.

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ABSTRACT... Objective: To determine the accuracy of estimated fetal weight by ultrasound compared with actual birth weight. **Study Design:** Cross Sectional study. **Setting:** Department of Radiology, Fatima Memorial Hospital, Lahore. **Period:** September 2017 to January 2018. **Material & Methods:** A sample of 139 pregnant women who fulfilled the inclusion and exclusion criteria were included in this study Ultrasonography of full term pregnant women was performed to determine the comparison and accuracy with the actual weight of baby at birth. **Results:** In a sample of 139 pregnant women, the mean age was 27.8 ± 4.2 years (with minimum age of 20 years and maximum age of 40 years). Ultrasonographic estimated fetal weight and actual birth weight was compared by using paired t-test. No significant difference was found between estimated fetal weight and actual birth weight with P-value 0.237. **Conclusion:** Ultrasound is highly sensitive, good, reliable, safe and accurate modality for estimation of fetal weight. There is no significant difference between fetal weight and actual birth weight.

Key words: Birth Weight, Fetal Weight, Ultrasound.

INTRODUCTION

Estimation of fetal weight is an extremely important part of antenatal monitoring. Fetuses that weigh 2499 grams or less at time of delivery are labeled "low birth weight" (LBW)[1] while, on the other end of the spectrum, fetuses labeled macrosomic weigh more than the 90th percentile for their gestational age (which comes to 3543 grams at 37 completed weeks) or above 4000 g at any age.[2] A large number of complications are associated with these conditions. LBW babies are at high risk of developing infections, developmental disabilities and respiratory distress syndrome. Macrosomias associated with increased fetal risk of, greater incidence of instrument assisted delivery, shoulder dystocia, intrapartum asphyxia and brachial plexus injuries, as well as maternal risks that include postpartum haemorrhage, birth canal injuries and pelvic floor trauma.[3] Since the prevalence of macrosomia and LBW in Pakistan are alarmingly high, being 31.4%[5] and 15.7%[4] respectively, it is necessary

that accurate antenatal fetal weight estimation be done so that patient management can be guided along the right direction as early as possible.

Before the advent of ultrasound, clinical palpation was used to access fetal weight; however it was highly dependent on the skills of the clinician and sometimes suffered errors as high as 50%.

With ultrasound, estimation of birth weight is being done using various fetal parameters. Among the most commonly used formulae is the one designed by Hadlock et al that incorporates fetal head circumference (HC), femur length (FL) and abdominal circumference (AC) to determine fetal weight. Studies have been done to establish its accuracy in USA and European countries and demonstrated that the formula is accurate in 56% of fetuses weighting less than 2500 g, in 58% of fetuses weighing between 2500-4000 g and in 62% of fetuses weighing above 4000 g.[6] However, the data available for Pakistani population is

not adequate. Since the maternal nutritional status, environmental factors and ethnicity in Pakistan are vastly different, there is a clear need for a proper study to determine its accuracy in Pakistani population; especially since a study done in Nepal indicates that in 40% of cases, the estimated weight fell outside the acceptable 10% margin of actual birth weight (ABW).[7]

The aim of this study is to determine the accuracy of estimated fetal and actual birth weight. False estimation of fetal weight results in unnecessary C-sections and pre-term deliveries with subsequent fetomaternal complications[8] and an accurate estimation will decrease the frequency of these undesirable outcomes.

MATERIAL & METHODS
This study design was cross sectional. This study was conducted in the Department of Radiology, Fatima Memorial Hospital, Lahore. This study was conducted from September 2017 to January 2018. A sample size of 139 pregnant women was calculated for the study with expected rate of 10% ultrasonographic estimated weights were lower of the actual birth weight at 5% level of significance.

$$n = \left(\frac{z}{e}\right)^2 P(1-P)$$

z = 1.96
e = 5%
P = 10%

Simple random sampling technique was used.

Inclusion Criteria
- Pregnant women who present at gestational age of 36 weeks or greater that and are due for delivery or C-section on the same day.
- Pregnant women who were apparently normal.
- Singleton pregnancy.

Exclusion Criteria
- Any congenital anomalies in the fetus diagnosed on ultrasound that distort the anatomical parameters being measured in the research (e.g. hydropsfetalis, hydrocephalus etc.)
- Multiple pregnancies.

Proforma was used to collect the data of inclusive patients who were pregnant and at full term in the gynae obs ward of Fatima Memorial Hospital Shadman, Lahore.

Data was analysed by using IBM-SPSS V-21[IBM Corp]. Quantitative variable like weight was expressed as mean ± SD, whereas qualitative variables were expressed in form of frequency and percentage.

RESULTS
Total number of women included in this study were 139, the mean age was 27.8±4.2 years (with minimum age of 20 years and maximum age of 40 years) as shown in Table-I and Figure-1.

N	Minimum Age	Maximum Age	Mean ± SD
139	20 years	50 years	27.8±4.2

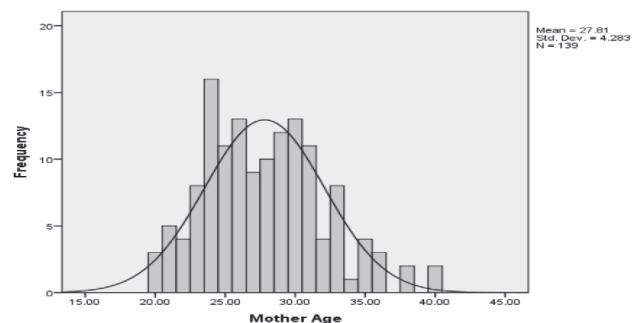**Table-I. Mean age of pregnant women.**

Figure-1. Histogram for mean age of pregnant women.

Out of 139 deliveries only 22 babies were born via vaginal delivery and remaining 117 through C-section as shown in Table-II and Figure-2.

Delivery Status	N	Percentage
Vaginal	22	16%
C- Section	117	84%

Table-II. Delivery status of pregnant women.

Ultrasonographic estimated fetal weight and actual birth weight was compared by using paired t-test. there is no significant difference between estimated fetal weight and actual birth weight with P-value 0.237. The mean of fetal weight was 2.9516±0.59 kg (minimum weight 1.09 kg

and maximum 4.47kg). The mean of actual birth weight was 2.9948±0.60 kg (minimum weight was 0.96 kg and maximum weight was 4.78 kg) as shown in Table-III and Figure-3.
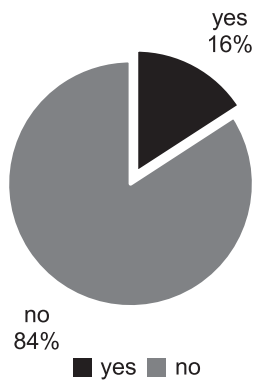

Figure-2. Percentage wise distribution of delivery status.

Weight	Mean	SD	P-Value
Fetal Weight(Kg)	2.9518	.59430	0.237[N.S]
Actual birth weight (Kg)	2.9948	.60251	

Table-III. Comparison of ultrasonographic estimated fetal weight and actual birth weight.
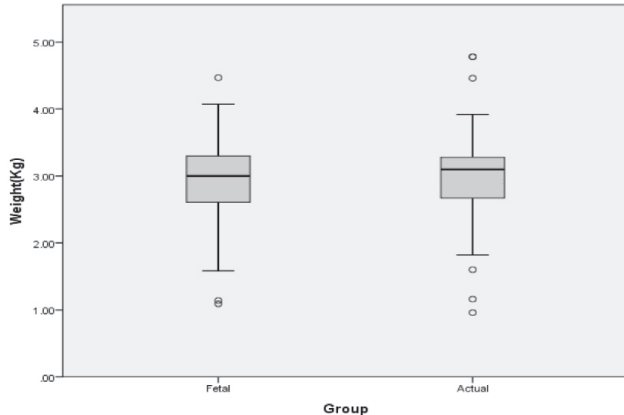

Figure-3. Comparison of ultrasonographic estimated fetal weight and actual birth weight.

DISCUSSION

The results of the study show that fetal weight estimation by ultrasound is accurate in determining fetal weight in Pakistan as it is in foreign countries. Fetal weight estimation is of significant importance for the obstetrician, particularly in cases where risk of fetal weight deviation is present. Low birth weight babies have increased chance of perinatal morbidity and mortality and are more susceptible to hospital acquired infections, developmental disabilities, respiratory distress syndrome and increased stay in the neonatal critical care unit. On the other end of the spectrum, overweight babies impose great risk to themselves as well as the mother during and after delivery. Incidences of shoulder dystocia, brachial plexus injury, clavicle fracture, instrumentation delivery, perineal trauma and postpartum hemorrhage are greater in macrosomic fetuses. Several maternal and pregnancy related factors play a role in determining term fetal weight and include gestational age at time of delivery, parental heights, maternal race, weight and hemoglobin concentration among others. Pakistan is a developing country and malnutrition is quite prevalent. As a result, pregnant women often do not have enough dietary intake for healthy growth of fetus and this is further complicated by poor immunity, fetomaternal infections and subsequent premature deliveries.

In the current study, fetal weight was estimated and the mean gestational age at delivery was 27.80±4.2 years. 16% of the cases delivered vaginally and 84% underwent caesarean surgery. In our study the average birth weight in kg was 2.99 ±0.60. This was similar to the mean actual birth weight of 2.9±0.28 kg reported by Dr M. Muralisree et al (2015) in Nigeria[9] and slightly lower than 3.24±0.50 reported by Charles Njoku (2014) in South Nigeria[10] and 3.393±0.60 kg reported by Cletus (2015) in Nigeria.[11] However, it is slightly higher than 2.817±0.78 kg reported by Sabrina Q (2015) in Bangladesh.[12] The reason may be due to several factors affecting birth weight for example socioeconomic and regional factors.

The mean of ultrasonographic estimated fetal weight was 2.9518±0.59. When the result was compared with actual birth weight, it was found that actual birth weight was not significantly different. A good correlation was found between estimated fetal weight and actual birth weight (r= 0.744).

The sample size was small, limited to 139 patients due to time constraints. A larger sample size collected over a longer time interval would give

more reliable results.

The study was conducted at only a single center in Lahore and catered to a limit demographic group. A multicenter study would be more effective.

The study only contains babies delivered at 36 weeks or later. Including earlier delivery dates will be helpful for assessing the fetal weight of preterm deliveries where the information may be more useful than in a term baby.

The study only considers singleton pregnancies and excludes twins, triplets and so on. Importance of fetal weight in those cases is more important as many of them may have to be delivered before term depending on pregnancy and maternal conditions. Making that decision will be easier for the obstetrician when provided with proper fetal weight information. For better results, these limitations may be avoided in future trials.

CONCLUSION
Ultrasound is highly sensitive, good, reliable, safe and accurate modality for estimation of fetal weight. Therefore it can be reliably used to estimate fetal weight in Pakistani population.
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AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Summan Hameed	Contributed in the conception and design, or analysis and interpretation of data.	
2	Zobia Saleem	Contributed in conception of study design.	
3	Mehwish Rauf	Conception of study design.	
4	Tayyaba Aslam	Drafted the work.	
5	Aqsa Hafeez	Drafted the work.	
6	Irum Khan Mehmood	Verified the analytical methods.	