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Sonographic Comparison of Estimated Fetal Weight (EFW) in Diabetic and Non-Diabetic Mothers During 3rd Trimester

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Abstract
Background: Diabetes during pregnancy is very common that increase the complications in pregnancy. This study aimed to compare the EFW in Daibetic and non-diabtic mothers. during 3rd trimester. Objective: To compare sonographically the Estimated fetal weight (EFW) in diabetic and non-diabetic mothers during 3rd trimester. Methods: The study will be conducted in 35 diabetic and 35 non diabetic mothers during 3rd Trimester. To assess EFW the BPD, AC, and FL will be recorded on USG. In Diabetic mothers, the diabetes will be confirmed by Gluccometer. Results: The group statistics showed that mean estimated fetal weight among offsprings of 35 diabetic and 35 non-diabetic mothers were 2.3 and 2.0, respectively. The calculated fetal weight estimation among fetuses was as low as 1042g and as high as 4090g. Mean difference of estimated fetal weight in Diabetic & Non-Diabetic pregnant women that calculated as 2085.8285 for non-diabetic and 2334.5142 for diabetic mothers. Conclusions: It is concluded that there were no such prominent differences among the Estimated fetal weight in diabetic and non-diabetic mothers.

Keywords: Estimated Fetal Weight, Biparietal Diameter, Abdominal Circumference, Femur Length, Macrosomia

Introduction

Diabetes is a disease that is associated with the increased amount of sugar in plasma, also called as hyperglycemia (Asmat, 2016). It is caused by defects in insulin discharge, insulin accomplishment, or both. The causes may be environmental, genetic, and some chemicals and drugs that destroy pancreatic cells (Herold, 2002). Type 1 DM is one of the endocrine and metabolic conditions occurring in childhood. This disorder is caused by the harm to the pancreas that leaves it, delivering either next to no insulin or none by any means (Alper, 2019). Type II diabetes otherwise called non-insulin subordinate diabetes mellitus, is commonly well-known type of diabetes (accounting for more than 90% of all cases), it is not quite the same as type I diabetes mellitus as insulin is produced by the pancreas yet the body's cells step by step lose the capacity to retain and utilize the insulin (DeFronzo, 2015). However Gestational diabetes mellitus (GDM) is low sugar level that happens during pregnancy and ordinarily vanishes after the deliveries. It can happen in any phase of pregnancy however, it is progressively regular in the second trimester (Ural, 2008). A mother with glucose intolerance is linked with an expanded danger of by birth anomalies, neonatal malformations, and even fetal death (Evers, 2004). Diabetes during pregnancy is very common that increase the complications in pregnancy. The large gestational age percentage (LGA) was 50% in women with T1DM and 23% in women with T2DM (Kristensen,

2017). The standard laboratory methods used to diagnose the Diabetes mellitus in pregnancy is the plasma glucose level test. The diagnosis includes BSR (blood sugar random), Glycated hemoglobin test (A1C) that measures the percentage of blood glucose, which is attached to the hemoglobin (Michels, 2014). When the finding of diabetes is set up in a pregnant lady, continues screening for glucose intolerance and diabetic inconveniences are shown for the rest of the pregnancy (Ballas, 2012). Different imaging systems can be utilized to identify the different appearances and the subsequent inconveniences happening over the span of disease (Rastogi, 2016). However, the modality of choice for the examination of fetal weight estimation in glucose intolerance mothers and in non-diabetic pregnancies is ultrasound. It is a non-invasive screening test that sonographers may use to identify physical abnormalities in pregnancy with good accuracy (Appleton, 2005). Biperietal diameter, abdominal circumference of a neonate, and femur length measurement is best diagnosed on ultrasonography (Langer, 005). The estimation of the infant's weight by ultrasound is routinely used in clinical practice (Zhang, 018). Fetal weight is assessed by taking a combination of estimations that are altogether identified with three anatomical locales, the fetal head, the stomach area, and femur length (Schild, 2000). Both BPD and abdominal circumference are measured in axial plane however, the measurement of femur length is taken longitudinally. EFW can be utilized before incubation to screen fetal development, fetal sexual orientation, and ethnicity. It is a basic and clear marker of worldwide development that is anything but difficult to use for specialists and straightforward for patients, too (Salomon, 2007). Although the pregnant mothers that are associated with diabetes mellitus are at considerably high danger of producing lots of adverse maternal and fetal results, their babies are at elevated danger of early birth with low birth weight (Lin, 2017). The high glucose level in the mother puts extra fat in the baby, causing the fetus to grow larger than average. The estimated fetal weight of diabetic mothers is higher as compared to non-diabetic mothers (Katrien, 2010). This can cause large gestational age (LGA) or macrosomia and impaired glucose tolerance in infants (Feldman, 2016). The role of the US in pregnancy complicated by DM in the estimation of fetal weight, diagnosis of congenital malformation, and monitoring diabetic pregnant patients (Dudenhausen, 2015). By using low-cost technology, the neonatal morbidity rates and other maternal, as well as fetal complications, can be reduced. The benefits of this study should be weighed against the potential for expanded the amount of Cesarean deliveries and higher health care costs (Killestein, 2002).

Methods

It was a comparative cross-sectional study carried out in the Department of Radiology, Lady Willingdon Hospital Lahore, and University Ultrasound clinic Lahore. The expected duration of the study is from May 2019 to July 2019.The study was conducted on 35 diabetics and 35 non-diabetic mothers during 3rd Trimester. Both USG and Blood Sugar Random (BSR) were performed. Doppler Ultrasound machine Vision equipped with 3.5-5 MHZ curve linear multi-frequency transducer was used to scan fetus using a transabdominal approach with the subject lying in the supine position. To assess the EFW, Fetal Biparietal Diameter, Abdominal Circumference, and Femur Length were recorded on USG. In Diabetic mothers, diabetes was confirmed by using Gluccometer. The collected data was stored in EXCEL, predesigned data collection sheets, and SPSS software were used to apply relevant tests for statistical analysis. As the research follows scientific method, related information was taken from the recent articles, and the references were given in the chapter of references.

Results

In our research, data of 35 diabetics and 35 non-diabetic mothers were recorded. Women entered for ultrasound examination were minimum 20 years and maximum of 41 years old with the mean of 30.
The group statistics showed that mean estimated fetal weight among offsprings of 35 diabetics and 35 non-diabetic mothers were 2.3 and 2.0, respectively. It means their mean difference was very little or maybe neglectable. Table I.

Table 1: Mean Differences among EFW of diabetic and non-diabetics.

Group Statistics

EFW	N	Mean	Std. Deviation	Std. Error Mean
Diabetic	35	2.3345E3	723.04537	122.21697
non-diabetic	35	2.0858E3	683.82069	115.58679

According to the T-test for Equality of Means, the mean differences (248.68) and standard error differences (168.21) of EFW were same in assumed and not assumed equal variance. Table II.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
EFW	Equal variances assumed	.003	.958	1.478	68	.144	248.68571	168.21800	-86.98808	584.35951
	Equal variances not assumed			1.478	67.790	.144	248.68571	168.21800	-87.00695	584.37838

Among 35 diabetic and 35 patients with absence of diabetes, 22 females had maximum parity of 2 while 13 females were nulliparous. Table III, IV.

Table 3: Frequency table of diabetes and non-diabetes

	Frequency	Percent
Absent	35	50.0
Present	35	50.0
Total	70	100.0

The percentage of hypertensive females (22) in our study was 31.4 .while percentages of majorities of mothers (48) with normal blood pressure was 68.6. Total 41 mothers (58.6%) claimed with a positive family history of diabetes mellitus. Out of 70 females, 29 mothers (41.4%) had a family history with DM.Table V, VI.

The data showed that 33 pregnancies (47.1%) had not gone for abortion or miscarriage, whereas in 37 pregnancies miscarriage percentage was 52.9%. Among the sample size, the frequency of smokers was very low, 8.6% .most of the mothers were nonsmokers 91.4%. Table 9 represents the multiple comparisons of descriptive statistics of age, so the females came for ultrasound examination were minimum 20 years and maximum 41 years old with the mean of 29.5 (round of 30). Table VII, VIII, and IX.

Mean gestational age recorded in total sample size was 33.88; the multiple comparisons of descriptive statistics had minimum 28weeks and maximum of 41 weeks of gestational age. The calculated fetal weight estimation among fetuses was as low as 1042g and as high as 4090g. Mean estimated fetal weight recorded as 2.2. Table X, XI.

Table 11:

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
EFW	70	1042.00	4090.00	2.21023	709.72603

The measurements of femur length for fetal weight estimation had examined the mean value as 63.93mm. Descriptive statistics for mean FL for both minimum and maximum measured 50.60mm and 81.60mm, respectively that are shown in Table XII.

The minimum abdominal circumference in total females recorded as 223.10mm while the maximum AC value was 363.70mm. The average abdominal circumference measurement in 70 mothers was 290.63mm. Descriptive statistics for AC is shown in Table XIII.

Biparietal diameter had to mean examined as 82.70mm, whereas 66.20mm and 96.40mm were calculated as a minimum and maximum BPD measurements, respectively. Among 70 pregnant ladies, the number of parity varied from 0 to 5 and the mean recorded as 1.8(round of 2). Table XIV, XV.
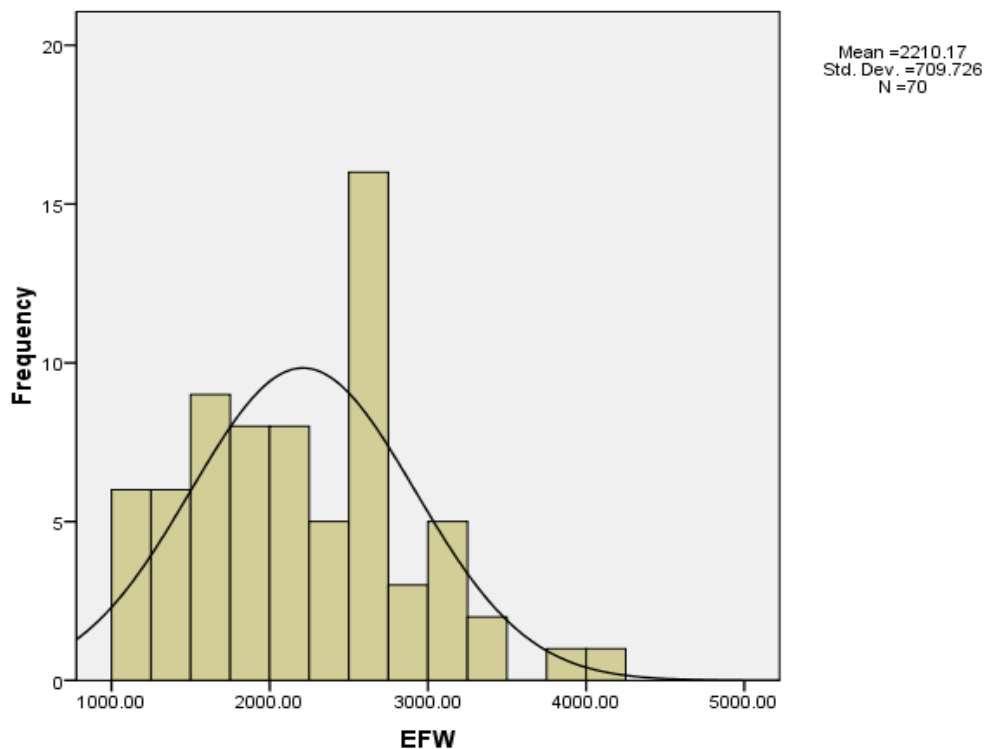

Figure 13 shows the mean difference of estimated fetal weight in Diabetic & Non-Diabetic pregnant women that calculated as 2085.8285 for non-diabetic and 2334.5142 for diabetic mothers.
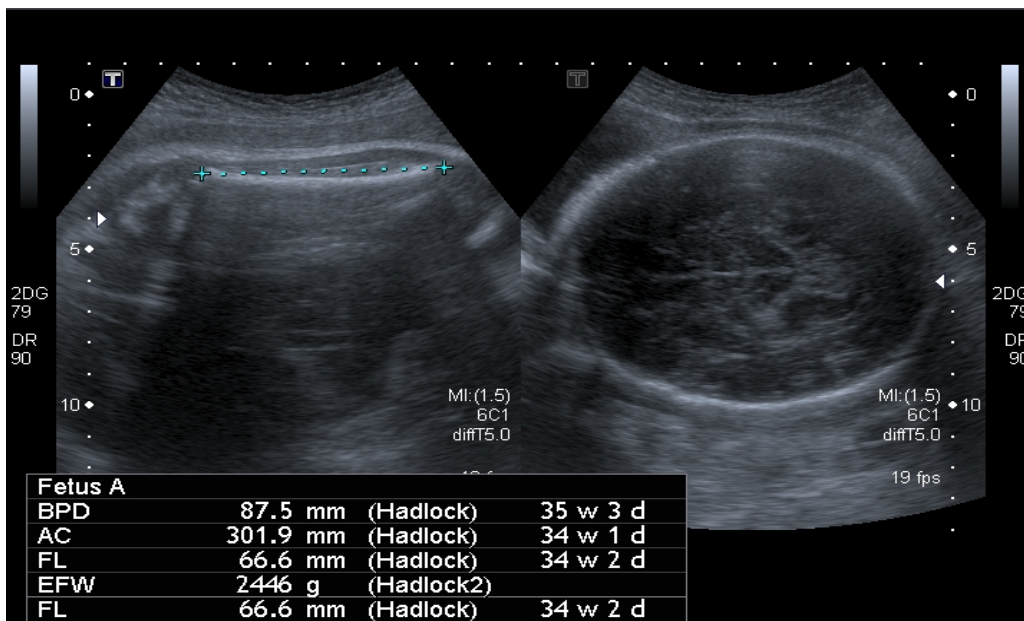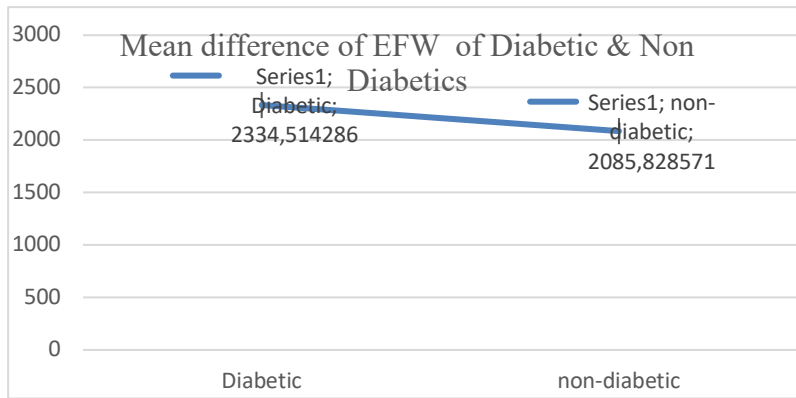
Mean difference of EFW of Diabetic & Non Diabetics

Series1; Diabetic; 2334,514286

Series1; non-diabetic; 2085,828571

Fetus A			
BPD	87.5 mm	(Hadlock)	35 w 3 d
AC	301.9 mm	(Hadlock)	34 w 1 d
FL	66.6 mm	(Hadlock)	34 w 2 d
EFW	2446 g	(Hadlock2)	
FL	66.6 mm	(Hadlock)	34 w 2 d

Image 1 shows normal fetal measurements in non-diabetic mother with EFW 2466g in 34w2d of GA.

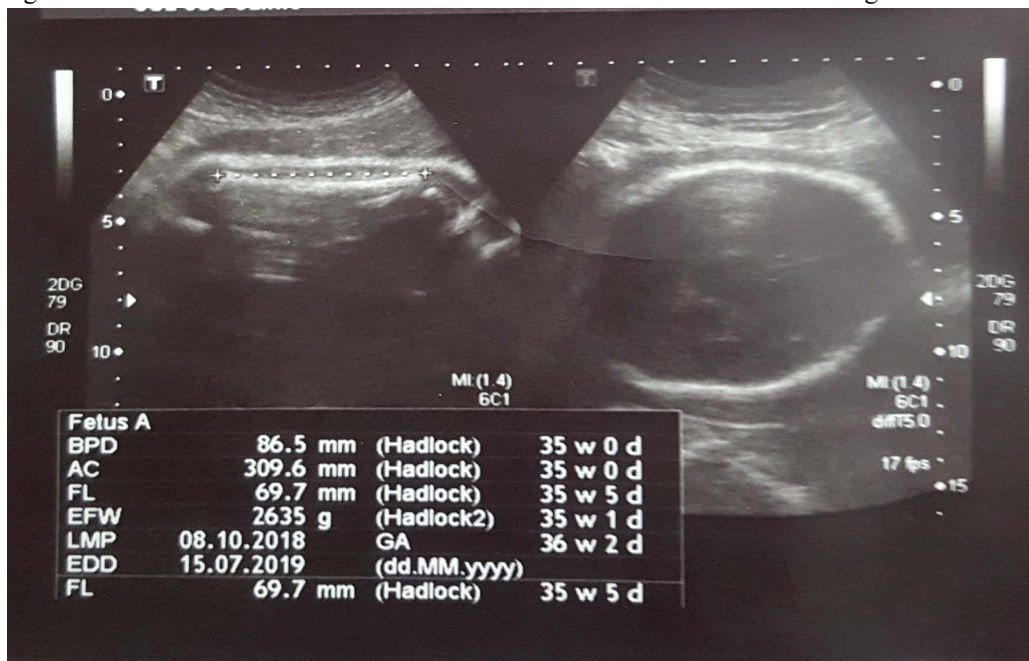| Fetus A			
BPD	86.5 mm	(Hadlock)	35 w 0 d
AC	309.6 mm	(Hadlock)	35 w 0 d
FL	69.7 mm	(Hadlock)	35 w 5 d
EFW	2635 g	(Hadlock2)	35 w 1 d
LMP	08.10.2018	GA	36 w 2 d
EDD	15.07.2019	(dd.MM.yyyy)	
FL	69.7 mm	(Hadlock)	35 w 5 d

Image 2 shows fetal measurements in Diabetic mother with EFW 2635g in 35w0d of GA.

Discussion

It was a cross-sectional comparative study on the topic of the sonographic comparison of estimated fetal weight (EFW) in diabetic and non-diabetic mothers during 3rd trimester. It was performed on Lahore population in 2019. The main purpose of this research work was to compare fetal weight estimation (EFW) in diabetic and non-diabetic mothers in last trimester using ultrasound methodology. Ultrasound technique is used to detect the estimated fetal weight, which is recorded by combining the measurements of BPD, AC, and FL during 3rd trimester. We examined fetal weights estimation of 35 diabetics and 35 non-diabetic mothers in the radiology department of Lady Willingdon Hospital Lahore. Women entered for ultrasound examination were minimum 20 years and maximum of 41 years old with the mean of 30.

According to the previous researches, the estimated fetal weight is seemed to be higher in diabetic mother's neonates than in non-diabetics. A study was done in Saudi Arabia in 2012 on fetal outcome in diabetics and non-diabetics pregnancies. They examined 314 diabetic ladies; 86 gave birth to macrosomic babies who weigh more than 4000g, and these babies later in life got the glucose intolerance. Their study concluded that maternal diabetes is the main cause for macrosomic infants and other adverse fetal outcomes as well (Nadir, 2012).

The other study data was investigated in 2018 on precision of estimated fetal weight (EFW) using ultrasound examination in assumed macrosomic infants. Sum of five hundred and two ladies were analyzed, out of these three hundred and one mothers had a fetal weight estimation between 4000–4249 g, one hundred and thirty-five patients had an estimated fetal weight between 4250–4499 g, while forty-five had a fetal weight between 4500–4749 g and twenty-one mothers sonographic EFW were above 4750 g. In each estimated fetal weight gathering, the danger of increased birth weight was more prominent as compared to 50% (Zafman, 2018).

Another of study was conducted on the topic of fetal weight at birth, and Parental body mass index estimates the increased fetal weight in newborns of GDM Mothers that was investigated in (2005). The technique involves the obstetrical ultrasound. Their goal was to explore the development of youngsters from pregnancies with diabetes mellitus at gestation. Sixty-nine percent of offspring of guardians with an index of body mass was either high or equal to 30 kilograms per meter square had increased weight. Through this study, they concluded that females with gestational diabetes mellitus had newborns with increased weight than normal, and they were related with intrauterine progression and obesity of mother or father as well (Schaefer-Graf, 2005).

Another multicentre study was performed on the topic of The role of gestational diabetes, pre-pregnancy body mass index and gestational weight gain on the risk of newborn macrosomia, and this was done in 2014. The objective of the study was to investigate the independent role of pre-pregnancy BMI, Gestational weight gain, and gestational diabetes mellitus on the risk of macrosomia. It is already known that both obesity and gestational diabetes mellitus are major risk factors for unwanted maternal and fetal outcome, these factors increased the occurrence of Large Gestational Age fetuses and macrosomia (defined as baby's birth weight over 4000 g). The sample included 14109 mothers with complete records Relationship between presentation factors, and infant macrosomia were examined. Maternal excessive fat, gestational obesity, and gestational diabetes mellitus resulted to be independent indicators of macrosomia. The study concluded that the findings indicated that maternal obesity, gestational weight increase, and diabetes should be considered as independent risk factors for newborn macrosomia. To satisfactorily assess the clinical development of pregnancy, all three factors should need to be carefully monitored and observed (Alberico, 2014).

In contrast, our analyzed data showed different results, offspring of mothers having glucose intolerance and offspring of normal mothers had the calculated fetal weight estimation was as low as 1042g and as high as 4090g. Mean estimated fetal weight recorded as 2.2. There were no such prominent differences among newborn's average EFW.

Conclusion

It is concluded that there were no such prominent differences among the average estimated fetal weight in diabetic and non-diabetic mothers. Their offspring showed the same mean estimated fetal weight.

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