

Diabetes type and Fetuses outcomes: Ultrasonography Based Study.

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Abstract:

This was descriptive study done at Omdurman maternal hospital in Khartoum state-Sudan; during the period extend from 2017 to 2020. The **aim** of the study was to evaluate the effect of diabetes type in pregnant ladies, in second and third trimester. **Method:** Hundred and sixty five diabetic pregnant ladies were included. All were scanned by two dimensional ultrasound machine (Mindary) by applying the standard technique. The scan was done to evaluate the effect of diabetes type in fetal weight, gender, flow in umbilical artery, middle cerebral artery and evaluate amniotic fluid index. Maternal age, parity, and Hb A₁C (glycated hemoglobin) were also been evaluate. The study revealed that fetal liquor volume, fetal hearts activity, fetal gender, umbilical artery, middle cerebral artery, and fetus weight, maternal Hb A₁C and parity were not affected by diabetes type. While diabetes type have an effect on advanced maternal age.

Key words: Ultrasonography, Diabetes mellitus, Pregnancy.

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I. Introduction:

Diabetes mellitus (DM), commonly known as just diabetes, is a group of metabolic disorders characterized Symptoms often include frequent urination, increased hunger, Weight loss, Fatigue, Blurred vision. Diabetes can lead to number of serious complication (medical news today 2019) Acute complication includes ketoacidosis, hyper-osmolar, hyperglycemic state or death (Kitabchi, 2009). Serious long complication include cardiovascular disease, stroke, kidneys disease, foot ulcer, damage to the nerve, eyes, cognitive impairment (Saedietal 2016). Diabetes is due to either pancreas not producing enough insulin, or cell of the body not response properly to the insulin produced (Shbacketal 2011). There are three main types of diabetes mellitus. Type 1 diabetes result from pancreas failure to produce enough insulin, due to loss of beta cells. This form was previously referred to "insulin-dependent-diabetes mellitus or "juvenile diabetes" (diabetes Fact sheet Archived 2013). The loss of beta cells is caused by an autoimmune response. The cause of autoimmune response is unknown (Norman et al 2015). Type 2 diabetes begin with insulin resistance, a condition in which the cell fail to respond to insulin properly as the disease progresses, a lack of insulin may also develop (Jaypee brothers, 2012). This form was referred to as "non-insulin-dependent diabetes mellitus" (NIDDM), or "adult-onset diabetes". The most common cause is a combination of excessive body weight and insufficient exercise. Third one is gestational diabetes occurs when pregnant women without previous history of diabetes develop high blood sugar levels. Type 1 diabetes must be managed with insulin injection. prevention and treatment of type 2 diabetes involve maintaining a healthy diet, regular physical exercise, a normal body weight and avoiding use to tobacco (diabetes Fact sheet Archive 2013). Type 2 diabetes may be treated with medication such as insulin sensitizer with or without insulin (Rippe et al 2010). Insulin and some oral medication can cause low blood sugar (Picto et al, 2009). Gestational diabetes usually resolve after birth of baby (Vos et al 2012). Diabetes makes a pregnancy high risk. Diabetes can cause many potentially negative effects on the baby as well as mother. Blood sugar is the babies food source and passes from mother through placenta to the baby (EVMS)). Poor control of blood sugar can result in several complication include neonatal hypoglycemia, jaundice, stillbirth, birth defect the main complication is macrosomia. In response to the excessive amount of sugar that the baby receive, large amount of insulin produced by the fetal pancreas in order to convert the sugar into body fat; that is the baby is being "overfed" inside the uterus and as a result, the delivery can be more difficult for the baby and the mother with increase risk of injury to both in addition the odds of requiring cesarean delivery can be much greater when the baby is too large. Ultrasound scanning used in pregnancy allowed early detection of congenital anomalies

and assessment of fetal growth, in order optimizes timing and mode of delivery. (diabetes journal.org 2007). The fetal weight , amniotic fluid volume, the Doppler study of fetal umbilical artery and MCA are very important to evaluate the fetal outcomes. Therefore all the above parameters as well as mother’s parameter includes parity, age and the type of diabetes were also been evaluated.

II. Materials and Methods:

This was descriptive study carried out in Khartoum - Sudan at Maternal Hospital. The study conducted from November 2017 to November 2020 in which a group of (165) diabetic pregnant women underwent U/S examination for antennal care. Gray scale procedure was done in order to establish the data of the population. 2D Mindary ultrasound machine with Doppler facilities was used to scan the patients. The examination began with subject supine. First fast scan was done to survey all parts of the uterus and its content. Then a scan with details is done to evaluate and asses the heart activity, fetus number, intrauterine fetal weight by using Hadllok formula, amniotic fluid index by measuring large pocket . Complete scan was done for the pregnant women to evaluate form of flow in fetal umbilical artery, and middle cerebral artery (normal-reverse or absent) , fetal gender and mode of delivery. Other Variables was maternal age, parity, and maternal Hb A1C. Data were analyzed using SPSS program version16 to find the significances between the variables and diabetes type. The results were presented in the following tables.

III. Results:

Table(1): ANOVA test showed the condition between DM type and expected fetal weight (EFW)and different maternal status :

		N	Mean	Std. Deviation	Minimum	Maximum	P-value
Fetal EFW	IDDM	67	2944.26g	756.88	1200.00g	4375.00g	0.139
	GDM	67	3174.95g	751.71	428.00g	4500.00g	
	NIDDM	31	3191.93g	711.31	1000.00g	4348.00g	
maternal Age	IDDM	67	29.98	5.12	17.00	40.00	0.048
	GDM	67	32.19	5.91	19.00	43.00	
	NIDDM	30	32.16	5.76	18.00	44.00	
maternal Parity	IDDM	67	2.64	1.75	.00	7.00	0.143
	GDM	66	2.62	1.99	.00	9.00	
	NIDDM	30	3.43	2.47	1.00	11.00	
maternal HA1C	IDDM	66	15.79	73.43	.00	603.00	0.489
	GDM	66	6.68	2.28	.00	13.00	
	NIDDM	29	6.85	1.61	4.60	11.00	

***IDDM stands for Insulin dependent diabetes mellitus.**

***GDM stands for gestational diabetes.**

***NIDDM stands for non Insulin dependent diabetes mellitus**

***g stands for gram .**

Table (2): Chi-square test for association of Number of babies and DM type:

		Diabetes type				Total
			IDDM	GDM	NIDDM	
	Single	Count) %(	62)92.5%(	66) 98.5%(	31)100.0%(	159) 96.4 %(
	Twins	Count) %(	5)7.5 %(	1) 1.5 %(	0)0.0 %(	6)3.6 %(
Total		Count) %(	67) 100.0 %(	67)100.0 %(	31) 100.0 %(	165)100.0%
Chi-Square Tests		0.061				

Table (3): Chi-square test for association of heart activity and DM type:

		DM type				Total
			IDDM	GDM	NIDDM	
Heart Activity	Yes	Count	64(95.5%)	65(97.0%)	30(96.8%)	159(96.4%)
	No	Count	3(4.5%)	2(3.0%)	1(3.2%)	6(3.6%)
Total		Count	67(100.0%)	67(100.0%)	31(100.0%)	165(100.0%)
Chi-Square Tests						
		Value	df	Sig. (2-sided)		

Likelihood Ratio	0.228	2	0.892
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Table (4): Chi-square test for association of fetal gender and DM type:

		DM type				Total
			IDDM	GDM	NIDDM	
Fetal gender	Male	Count	33(49.3%)	29(43.3%)	12(38.7%)	74(44.8%)
	Female	Count	34(50.7%)	38(56.7%)	19(61.3%)	91(55.2%)
Total		Count	67(100.0%)	67(100.0%)	31(100.0%)	165(100.0%)
Chi-Square Tests						
		Value	df	Sig. (2-sided)		
Likelihood Ratio		1.067	2	0.586		

Table (5): Chi-square test for association of liquor volume and DM type:

		DM type				Total
			IDDM	GDM	NIDDM	
Liquor volume	Polyhydramnios	Count	9(13.4%)	13(19.4%)	4(12.9%)	26(15.8%)
	Average	Count	55(82.1%)	51(76.1%)	25(80.6%)	131(79.4%)
	Oligohydramnios	Count	3(4.5%)	3(4.5%)	2(6.5%)	8(4.8%)
Total		Count	67(100.0%)	67(100.0%)	31(100.0%)	165(100.0%)
Chi-Square Tests						
		Value	Df	Sig. (2-sided)		
Likelihood Ratio		1.285	4	0.864		

Table (6): Chi-square test for association of umbilical artery and DM type:

		DM type				Total
			IDDM	GDM	NIDDM	
Umbilical Artery	Normal flow pattern	Count	63(98.4%)	63(96.9%)	29(96.7%)	155(97.5%)
	Absent flow	Count	1(1.6%)	2(3.1%)	1(3.3%)	4(2.5%)
Total		Count	64(100.0%)	65(100.0%)	30(100.0%)	159(100.0%)
Chi-Square Tests						
		Value	Df	Sig. (2-sided)		
Likelihood Ratio		0.426	2	0.808		

Table (7): Chi-square test for association of middle cerebral artery and DM type:

		DM type				Total
			IDDM	GDM	NIDDM	
Middle Cerebral artery	Normal flow Pattern	Count	62(92.5%)	64(95.5%)	31(100.0%)	157(95.2%)
	Abnormal flow Pattern	Count	5(7.5%)	3(4.5%)	0(0%)	8(4.8%)
Total		Count	67(100.0%)	67(100.0%)	31(100.0%)	165(100.0%)
Chi-Square Tests						
		Value	Df	Sig. (2-sided)		
Likelihood Ratio		3.960	2	0.138		

Table (8): Chi-square test for association of mode of delivery and DM type:

		DM type				Total
			IDDM	GDM	NIDDM	
Mode of delivery	NVD	Count	6(9.0%)	5(7.5%)	3(9.7%)	14(8.5%)
	C/S	Count	61(91.0%)	62(92.5%)	28(90.3%)	151(91.5%)
Total		Count	67(100.0%)	67(100.0%)	31(100.0%)	165(100.0%)
Chi-Square Tests						
		Value	Df	Sig. (2-sided)		
Likelihood Ratio		0.167	2	0.920		

*NVD stands for normal vaginal delivery

*C/S stands for cesarean section

IV. Discussion:

Diabetes mellitus is one of the most common medical complication that affected pregnancy. The study was done to evaluate the effect of diabetes type on pregnancy. (Table 1) showed the results of (1-Way ANOVA) test for differences between subjects (DM types) in mean EFW (Expected fetal weight). According to test significance value (P-value) in the last determine if the different DM types were relatively have the same measures or if they were significantly different from one another, P-value was 0,139 which significant at 0,05 this mean diabetes type have no effect on fetal weight the majority of fetus was macrosomic. This result disagree with study done by (Donghua et al 2017) which Found that there may be an inverse linear association between weight and type two diabetes mellitus .

(Table 2) showed that there is no effect of diabetes type on number of fetus p-value was (0.061).(Table 3) showed that diabetes type have no effect on fetal heart activity p-value 0,892 this result disagree with study done by (H H Gunter et al .2006) which showed that the risk of intrauterine fetal death in pregnancies of diabetic women is still increased it seems that especially the LGA fetuses of diabetic mothers and SGA fetuses of non – diabetic mothers are at greater risk of intrauterine death .(Table 4) showed that diabetes type have no effect on fetal gender where p-value was 0,586 this result disagree with study done (S .F .Ehrlich et al 2015)women with gestational diabetes ,a condition characterized by excessive fuel substrates; appear to deliver more males. Women with pregravid diabetes the fewest males; possibly reflecting the unfavorable state of chronic disease .

(Table 5) showed that amniotic fluid volume doesn't depend on type of diabetes and this result disagree with study done by (J S Dashe et al 2000) under title correlation between amniotic fluid glucose concentration and amniotic fluid volume in pregnancy complicated by diabetes their result was the amniotic fluid index parallels the amniotic fluid glucose level among diabetes women .This finding raises the possibility that the polyhydramnios associated with diabetes is a result of increase amniotic fluid glucose concentration . It may represent fetal polyuria secondary to fetal hyperglycemia. (Wilkins1987).

(Table 6,7) showed that the form of flow in umbilical artery and middle cerebral artery were not affected by diabetes type , these results agreed with study done by (Rasha Omer et al 2020) They found no significant association between impedance to flow in umbilical artery and maternal serum glucose concentration . and agree with other study done by (london et al 1989) performed serial measurements of impedance to flow in the umbilical artery in insulin dependent diabetic women during second and third trimester and found no association between impedance of flow in umbilical artery and in insulin dependent diabetic .

(Table 8) : showed that the type of diabetes had no effect on mode of delivery the majority of cases was caesarian section 91.5%. And this finding may be result to macrosomic fetus or poor control of diabetes .This result disagree with study done by (Bedoor S. AL Omran et al 2016) in their study pregnancy outcome in relation to different type of diabetes mellitus and mode of delivery in macrocosmic fetus .Their result was 70% of patients with pre-existing diabetes had successful vaginal delivery.

The study revealed that maternal HbA1c was not affected by diabetes type p-value 0. 489, this result disagree with study done by (P Kaitlyn Edelson et. al 2020) which showed that HbA1c accurately reflects glycemia in first trimester but underestimates glucose intolerance in the late and second trimester, our result also reported that diabetes type have an effect on advanced maternal age p-value 0.048, However There is no significant relation between maternal parity and diabetes type p-value 0.143 .

Our study showed that the parity has no significant relation with the diabetes type ,this disagree with study results done by (Yang H ,et al 2014) that mentioned that the multiparity was associated with risk of diabetes

V. Conclusion:

This study was to evaluate the effects of diabetes type on pregnancy. The study revealed that liquor volume, Fetal hearts activity, gender , umbilical artery , middle cerebral artery , and fetus weight were not significantly affected by the diabetes type . No significant relation was found between maternal HA1C and parity diabetes type but a significant relation was found between diabetes type and maternal age at p=0,043 .Ultrasonography is excellent modality for assessing pregnancy and fetal out comes. Pregnancy should be planned in women with pre existing diabetes included a strict metabolic control of glucose levels to avoid complications and to improve fetal outcomes

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