

# FETAL OUTCOMES IN DIABETIC VERSUS NON DIABETIC PREGNANCIES

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## ABSTRACT

**Objective:** To observe maternal and fetal outcomes in diabetic mothers as compared to non diabetics.

**Material and Method:** This was an observational descriptive study. A total of 150 patients were included. Seventy five patients were diabetic while rest half were non diabetic. This study was carried out at Khan Research Laboratory Hospital(KRL) Islamabad -Pakistan,from July 2017 to December 2017. Statistical analysis was done using statistical package for social sciences version 17.0 (SPSS version 17.0)

**Results:** There was higher rate of caesarean sections in diabetics, 62.67% versus 30.67% in non-diabetics. Mean weight in diabetic mothers was  $82.41 \pm 15.72$  while in non diabetic patients it was  $71.01 \pm 11.85$ . Mean weight of baby in diabetic group was  $3.58 \pm 0.57$ kg as compared to  $2.9 \pm 0.62$ kg in non-diabetic group. There was almost double the rate of neonatal resuscitation in diabetic group (21.91% versus 10.66% with p. 0.001). Correspondingly, there is a 3- fold increase in Neonatal ICU (NICU) admission or observation in diabetics. Fetal macrosomia (weight of more than 4kg) was observed in 29 (38.67%) in diabetics versus 3 (4%) of cases in non diabetics. Mean weight of baby with HbA1c  $\leq 6.9$  was  $3.51 \pm 0.49$  while it was  $3.70 \pm 0.72$  with HbA1c  $\geq 7.0$ .

**Conclusion:** Caesarean section was performed twice as frequently in diabetics as compared to non diabetics. Fetal macrosomia was almost 10 times higher in diabetic pregnancies. Mean weight of baby tends to be higher in mothers with impaired glycemic control.

**Keywords:** Diabetic pregnancy, fetal macrosomia, caesarean section, diabetes, NICU

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**This article may be cited as:** Ali A, Saeed M, Fatima K, Nisar A. Fetal outcomes in Diabetic versus non diabetic Pregnancies. J Med Sci 2018; 26: (3) 229-233.

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## INTRODUCTION

Pregnancy is a physiological condition characterized by a series of hormonal changes<sup>1</sup>. Hyperglycemia detected first time during pregnancy can be classified as diabetes mellitus in pregnancy. Women with diabetes in the first trimester would be classified as having type 2 diabetes. Gestational diabetes mellitus (GDM) is diabetes diagnosed in the second or third trimester of pregnancy that is clearly not overt diabetes. It is usually recognized at 24 to 28 weeks of gestation on the basis of abnormal glucose tolerance testing. GDM is defined as any degree of glucose intolerance with onset or first

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**Date Received:** July 06, 2018

**Date Revised:** Aug 27, 2018

**Date Accepted:** Sept 20, 2018

recognition during pregnancy<sup>2</sup>.

Risk assessment for GDM may be undertaken at the first prenatal visit. Women with clinical characteristics consistent with a high risk for GDM including marked obesity, BMI  $>30$  kg/m<sup>2</sup>, previous history of GDM, glycosuria, strong family history of diabetes, or family origin in an area with high prevalence of Diabetes Mellitus (DM) like South Asian, African-Caribbean or Middle Eastern shall undergo glucose testing as soon as possible. Glycosuria detected during routine antenatal screening by reagent strip testing with 2+ or above on one occasion or 1+ or above on 2 or more occasions may indicate undiagnosed gestational diabetes. Women with risk factors should undergo 2-hour 75-gram oral glucose tolerance test (OGTT).

GDM is diagnosed with fasting plasma glucose level of  $\geq 5.6$  mmol/L (100mg/dL) or 2-hour plasma glucose level of  $\geq 7.8$  mmol/L (140mg/dL). Hyperglycemia during pregnancy is associated with maternal

and fetal complications. This increases neonatal and maternal morbidity and mortality<sup>1</sup>. Gestational Diabetes Mellitus (GDM) exposes the fetus to short-term complications that need to be understood especially in developing countries where maternal screening and treatment are deficient. 3-4 A meta-analysis has shown that treatment of GDM improves neonatal outcomes<sup>5,6</sup>. Fetal macrosomia is taken as birth weight more than 4,000g. About 15–45% of new-born of mothers with gestational diabetes Mellitus (GDM) may be affected<sup>7</sup>. Environmental factors usually surpass genetics in causing macrosomia<sup>8</sup>.

Obesity, GDM and presence of diabetes mellitus are the most prominent risk factors for macrosomia<sup>9,10</sup>. GDM has increased sharply with pandemic of obesity and type 2 diabetes the world over<sup>11</sup>. Gestational age, body weight gain during pregnancy, smoking and hypertension have a similar effect. Maternal obesity almost doubles the risk of macrosomia compared to women with normal weight<sup>12</sup>. Studies have provided evidence that postprandial glucose levels are more closely associated with macrosomia than fasting glucose levels<sup>13, 14</sup>.

Maternal HbA1c level were found to be positively correlated with infant weight in case group which indicates that as maternal HbA1c level increases, the birth weight of infant increase<sup>15</sup>. Low APGAR score is commonly found in diabetic as compared to non-diabetic pregnancies supporting the view that fetal hypoxia often complicates such pregnancies<sup>16,18</sup>.

In patients with GDM, outcome is impaired more in obese as compared to non-obese females<sup>19,22</sup>. Obese patients with GDM who received insulin for good glycemic control had improved outcomes<sup>19</sup>. The incidence of macrosomia is associated with pre-gestational body mass index (BMI) and is higher among infants born to GDM mothers than among infants born to non-GDM mothers<sup>23</sup>. Pregnancy in diabetic patients can lead to varying placental abnormalities including thickening of basal membranes of trophoblast<sup>24</sup>. A number of factors mainly good glycemic control influence these changes during critical phases in placental development<sup>25</sup>. Gestational diabetes is more common than pre-existing diabetes; it affects 2 to 5 percent of pregnancies. Peri-natal mortality is comparable to normal with good glycemic control but macrosomia persists to be higher<sup>26</sup>. The rationale of this study was to determine the effect of glycemic control on fetal outcomes in comparison to pregnancies of non-diabetic mothers.

### MATERIAL AND METHODS

This was an observational descriptive study. A total of 150 consecutive pregnant ladies (75 each diabetic and non-diabetic cohort) presenting to KRLH Islamabad

with age matched criteria were included in this study. Patient's age, weight, HbA1C level, proteinuria, baby's weight, baby's APGAR score were taken into account. Pregnant ladies with other endocrine diseases, bronchial asthma and co-morbidities other than hypertension were excluded from this study. This study was carried out at Khan Research Laboratory Hospital Islamabad Pakistan from July 2017 to December 2017. Statistical analysis was done using statistical package for social sciences version 17.0 (SPSS version 17.0).

### RESULTS

Study included 150 patients, half were diabetic while rest half were non diabetic. Amongst diabetics 42.7% (32) had GDM, 44% (33) had type-2 diabetes while 13.3% (10) had type-1 DM. Age in diabetics ranged from 17 to 45 yrs with a mean of 30.44 yrs. Non-diabetics age ranged from 17 to 41 yrs with a mean of 27.19 yrs. Minimum weight was 53 kg while the maximum was 120 kg with the mean of 82.41 kg in diabetics. Mean weight in non diabetic group was 71.01 kg. Glycated hemoglobin (HbA1c) in diabetic patients ranged from 5.1% to 10.7% with an average of 6.93%. About 28% patients in diabetic group had proteinuria ranging from 1+ to 3+ while it was 1.3% in non diabetics. Thirty (40%) patients amongst diabetics were also hypertensive while only 25.3% (19) amongst non-diabetics had hypertension. Caesarean section was performed in 62.6% of patients with diabetes while it was almost half in non diabetics (30.6%).

Fetal outcomes of diabetic mothers when compared with non-diabetic showed significant difference in terms of baby weight, APGAR score and the need for resuscitation. Mean weight of baby in diabetic group was 3.58 kg as compared to 2.9 kg in non-diabetic group. Poor APGAR Score was observed in 30.67% (23) babies born to diabetic mothers versus 12% (9) in non-diabetic group. There was almost double the rate of neonatal resuscitation in diabetic group (21.91% versus 10.66% with p value 0.001). Similarly there is a 3-fold increase in NICU admission or observation in diabetic group. This is shown in Table 1. Diabetic patients were also grouped according to average blood glucose control in terms of HbA1c. Relatively poor outcomes were observed in patients with HbA1c greater than 6.9. This is shown in Table 2. Table 3 shows details of mothers and baby's outcomes with HbA1C equal to or less than 6.9%. Fetal macrosomia (weight more than 4kg) was observed in 29 (38.67%) cases in diabetics versus 3 (4%) cases in non-diabetics as shown in Table 4.

### DISCUSSION

Identifying women with GDM is important to minimize maternal and neonatal morbidity. In the 1980s, David Barker and Colleagues anticipated that the major causes of cardiovascular and metabolic diseases

**Fetal outcomes in Diabetic versus non diabetic Pregnancies.**

**Table 1: Fetal Outcomes**

<b>Diabetics</b>		<b>Non Diabetics</b>	
	No of Patients with %ages		No of Patients with %ages
<b>Baby Outcome</b>		<b>Baby Outcome</b>	
Death	03 (4%)	Death	01 (1.33%)
Alive	70 (93.33%)	Alive	73 (97.33%)
IUD	02 (2.66%)	IUD	01 (1.33%)
<b>APGAR Score</b>		<b>APGAR Score</b>	
Good	50 (68.49%)	Good	64 (87.67%)
Poor	23 (31.50%)	Poor	09 (12.32%)
<b>Baby Weight (kg)</b>		<b>Baby Weight (kg)</b>	
Minimum	2.000 kg	Minimum	1.2000 kg
Maximum	5.000 kg	Maximum	4.4000 kg
Mean	3.57867 ± 0.571696	Mean	2.91622 ± 0.621096
<b>Resuscitation</b>		<b>Resuscitation</b>	
Yes	16 (21.91%)	Yes	08(10.66%)
No	57 (78.02%)	No	66 (88%)
<b>NICU admission /observation</b>		<b>NICU admission /observation</b>	
Yes	39 (53.42%)	Yes	12 (16%)
No	34 (46.57%)	No	62 (82.66%)

**Table 2: HbA1c ≥7.00 (30 patients):**

	<b>Number of Patients with% ages</b>	<b>P Value</b>
<b>Mode of delivery</b>		
C-Section	24 (80%)	0.001
SVD	04 (13.33%)	
Assisted	02 (6.66%)	
<b>Baby Outcome</b>		
Death	02 (6.66%)	0.001
Alive	26 (86.66%)	
IUD	02 (6.66%)	
<b>APGAR Score</b>		
Good	18 (60%)	0.001
Poor	10 (33.33%)	
<b>Baby Weight (kg)</b>		
Minimum	2.000 kg	0.001
Maximum	5.000 kg	
Mean	3.70333 ± 0.640842	

**Table 3: HbA1c ≤ 6.9 (45 patients)**

	<b>Number of Patients with% ages</b>	<b>P Value</b>
<b>Mode of delivery</b>		
C-Section	23 (51.11%)	0.001
SVD	16 (35.55%)	
Assisted	06 (13.33%)	
<b>Baby Outcome</b>		
Death	01 (2.22%)	0.001
Alive	41 (91.11%)	
IUD	00 (2.27%)	
<b>APGAR Score</b>		
Good	32 (71.11%)	0.001
Poor	10 (21.22%)	
<b>Baby Weight (kg)</b>		
Minimum	2.600 kg	0.001
Maximum	4.600 kg	
Mean	3.50952 ± 0.494758	

**Table 4: Baby Weight  $\geq$  4 kg**

Diabetics		Non Diabetics	
Minimum	4.000 kg	Minimum	4.1000 kg
Maximum	5.000 kg	Maximum	4.4000 kg
Mean	4.13871 $\pm$ 0.245869	Mean	4.2000 $\pm$ 0.173205
Percentage	(31)31.33 %	Percentage	(03)4 %

have their roots in early development<sup>11</sup>. There is now full-bodied proofs that babies exposed to hyperglycemic intrauterine environment experience significant short-term morbidity in their fetal and neonatal life. The risk is higher in both pre-gestational diabetes and poorly managed GDM.

In our study a significant difference of mother's weight and BMI was observed in both groups, mean weight of diabetics was 82.14 kg and that of non-diabetics was 71.01kg. Same was true for BMI with 30.06 in diabetics and 26.70 in non-diabetics. Caesarean section in diabetics was performed twice as frequently as non-diabetics. Overall, Caesarean section was performed in 62.66% in diabetic group. This is in comparison with a study conducted locally showing rate of caesarean section at 73%<sup>27</sup>. In our study caesarean section rates in gestational diabetes and pre-gestational diabetes were found to be 50% and 72.09 % respectively. A study conducted elsewhere revealed Caesarean section Induction rates of 60.9% for gestational and 79.8% for pre-gestational diabetics<sup>28</sup>. In our study, Poor APGAR in diabetics was observed to be 31.5%. About 34% of adverse fetal outcomes were reported by Sajani TT<sup>29</sup>. Likewise, NICU admissions or observation was required in 53.42% akin to a recent UK study reporting over half of infants of diabetic mothers admitted to a neonatal unit<sup>30</sup>. The HAPO study exhibited a continuous, positive association between maternal glycaemia and Baby weight<sup>31</sup>. Fetal macrosomia was observed in 38.66 % in diabetic pregnancies in our study. Kamana H et al demonstrated that macrosomia affects 15-45 % of newborns of women with diabetes<sup>6</sup>. In this study, 4% macrosomia was observed in non-diabetics in contrast to 12% by Kamana H et al<sup>6</sup>. A meta-analysis done in 2013 revealed that managing GDM with diet or insulin and achieving good diabetic control resulted in low risk of fetal macrosomia<sup>32</sup>. The main limitation of this study is that patients were not followed throughout the entire length of pregnancy. Being a descriptive cross-sectional cohort, single centered study are few other limitations.

## CONCLUSION

Caesarean section was performed twice as frequently in diabetics as compared to non-diabetics. Fetal macrosomia was almost 10 times higher in diabetic

pregnancies. Mean weight of baby tends to be higher in mothers with impaired glycemic control.

## RECOMMENDATIONS

Good glycemic before conception and tight glycemic control throughout pregnancy are important steps in diabetic uneventful pregnancies.

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**CONFLICT OF INTEREST:** Authors declare no conflict of interest

**GRANT SUPPORT AND FINANCIAL DISCLOSURE NIL**

### **AUTHOR'S CONTRIBUTION**

Following authors have made substantial contributions to the manuscript as under:

**Ali A:** Concept design, analysis, interpretation of data.

**Saeed M:** Literature review, data collection.

**Fatima K:** Bibliography

**Nisar A:** Literature Review bibliography

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.