ORIGINAL   PROF-0-4084

Perinatal outcome in diabetic mothers with relation to glycemic control during pregnancy.

Jawaria Rasheed[1], Saira Isa[2], Faizza Rasheed[3], Kashif Siddiq[4], Zahida Saqlain[5], Zoha Nasir[6]

1. FCPS
Consultant Gynaecologist
DHQ, Lodhran.
2. FCPS
PGR
Nishtar Hospital Multan.
3. MBBS, M.Phil Student
KEMU, Lahore.
4. FCPS
Senior Registrar
Civil Hospital Bahawalpur.
5. FCPS
Consultant Gynaecologist
DHQ Lodhran.
6. MBBS
Women Medical Officer
Rashid Lateef Medical College,
Lahore.

Correspondence Address:
Dr. Jawaria Rasheed
Gynaecologist
DHQ, Lodhran.
drjawariarasheed@gmail.com

Article received on:
30/03/2020
Accepted for publication:
04/08/2020

ABSTRACT… Objective: To determine the frequency of perinatal outcomes (macrosomia, large for gestational age, birth asphyxia) in pregnant diabetic women with low and high plasma glucose levels between 36-40 weeks. **Study Design:** Cross-sectional study. **Setting:** Department of Obstetrics & Gynaecology, DHQ Hospital, Lodhran. **Period:** 2017 to 2019. **Material & Methods:** Total 285 diabetic women of age 25-40 years with singleton pregnancy of gestational age 36-40 weeks were selected. Patients with multiple pregnancies, GDM, renal disease and hypertension were excluded. Plasma glucose levels (fasting & 2 hour post-prandial) measured and mean values (fasting + postprandial/2) calculated. The mean values falling between 100-139 mg/dl were taken as low plasma glucose level where as ≥140 mg/dl noted as high plasma glucose level. The perinatal outcomes (macrosomia, large for gestational age, birth asphyxia) were assessed at the time of delivery. **Results:** Mean age was 29.44 ± 6.01 years. Mean plasma glucose levels were 109.77 ± 6.81 mg/dl. Perinatal outcome i.e. macrosomia, large for gestational age infants and birth asphyxia was found in 7.72%, 27.37% and 22.81% respectively. In this study that pregnant women with mean plasma glucose of 100-139 mg/dl showed frequency of macrosomia by 3.59%, large for gestational age 16.17% and birth asphyxia 14.35% while women with mean plasma glucose of ≥140 mg/dl showed frequency of macrosomia by 13.56%, large for gestational Age 43.22% and birth asphyxia 34.75%. **Conclusion:** Pregnant diabetic women with high plasma glucose levels have significantly high percentage of large for gestational age, birth asphyxia and macrosomia as compared to diabetic mothers with low plasma blood glucose levels. Consider diabetic mothers at risk and implement efficacious treatment in order to reduce the perinatal complications.

Key words: Pregnant Diabetic Women, Perinatal Outcomes, Plasma Glucose Levels.

INTRODUCTION
The diabetes (type 1 or 2) before pregnancy is called pregestational diabetes (PGDM) whereas gestational diabetes mellitus (GDM) is diagnosed as hyperglycemia first encountered during the pregnancy.[1] During the period of fetal organogenesis (till 12th week post conception), poor glycemic control is related with high incidence of congenital anomalies and spontaneous abortion. The elevated levels of HbA1c (glycosylated haemoglobin) exponentially raises the risk while normal HbA1c during early pregnancy has 2% malformation risk which is similar with the background population.[2]

Therefore it is imperative to diagnose and counsell a women having pregestational diabetes mellitus. Poor glucose levels during the pregnancy increases 2-4 times the risk of macrosomia and its sequelae.[3-5] Moreover, perinatal morbidity and mortality rates are also higher. The perinatal mortality (1st week neonatal deaths & stillbirths) among diabetic women are 2-4 times higher than non-diabetics and perinatal morbidity (birth asphyxia, LGA, macrosomia, neonatal hypoglycemia) is also increased.[2,3] Maternal health is adversely affected in pre-gestational diabetes mellitus along with fetal complications. Treatment related complication for mother include hypoglycemia in addition to worsening of pre-

existing micro & macro-vascular complications (neuropathy, retinopathy, nephropathy and CVS disease).[2]

No such study had been done before in our general population. This study would guide doctors to consider diabetic mothers at risk and implement efficacious treatment to improve patient outcomes and reduce complications.

MATERIAL & METHODS

This hospital based cross-sectional study was done from 2017 to 2109 at DHQ hospital Lodhran after approval from local ethical committee. Total 285 pregnant diabetic women of age 25-40 years having Diabetes (Type 2 diabetes mellitus) for > one year, presented to the department of Obstetrics & Gynaecology, DHQ hospital Lodhran, were selected after informed consent. Women with multiple pregnancy, hypertension, gestational diabetes and renal disease were excluded. The demographic profile like age, parity, BMI & gestational age were noted.

Plasma glucose levels (fasting & 2 hour post-prandial) measured and mean values (fasting + postprandial/2) calculated. The mean values falling between 100-139 mg/dl were taken as low plasma glucose level where as ≥140 mg/dl noted as high plasma glucose level. The perinatal outcomes (macrosomia, large for gestational age, birth asphyxia) were assessed at the time of delivery. All the procedures of delivery were done under the supervision of consultant gynecologist having 3 years post fellowship experience.

SPSS version 20 used to analyze the data. Frequency and percentage were calculated for age groups, low & high plasma glucose level, macrosomia, Large for Gestational Age and birth asphyxia. Mean ±SD were presented for quantitative variables like age, gestational age, height, weight, BMI, parity, duration of diabetes and plasma glucose level. Perinatal outcome was compared among diabetic women with low verses high plasma glucose level. Chi square test was applied.

RESULTS

Mean age was 29.44 ± 6.01 years. Majority of the patients 109 (38.25%) were between 25 to 30 years of age as shown in Table-I. Mean gestational age in our study was 37.88 ± 0.71 weeks with majority of patients i.e. 168 (58.95%), were between 36 to 38 weeks of gestation. Mean height and weight was 167.33 ± 16.78 cm and 67.41 ± 7.87 kg respectively. Mean BMI was 31.22±4.37kg/m². Mean parity was 2.81 ± 0.97. Mean duration of disease was 5.52 ± 3.18 years. Mean plasma glucose levels were 109.77 ± 6.81 mg/dl as shown in Table-II.

Perinatal outcome i.e. macrosomia, large for gestational age infants and birth asphyxia was found in 7.72%, 27.37% and 22.81% respectively as shown in Table-III. In this study that pregnant women with mean plasma glucose of 100-139 mg/dl showed frequency of macrosomia by 3.59%, large for gestational age 16.17% and birth asphyxia 14.35% while women with mean plasma glucose of ≥140 mg/dl showed frequency of macrosomia by 13.56%, large for gestational Age 43.22% and birth asphyxia 34.75% (Table-IV).

Age Group (years)	No. of women	Percentage
25 -30	109	38.25
31-35	95	33.33
36-40	81	28.42
Mean ± SD	**29.44 ± 6.01**	

Table-I. Percentage regarding age distribution (n=285).

Plasma Glucose Levels (mg/dl)	No. of Women	%age
100-139 mg/dl	167	58.60
≥140 mg/dl	118	41.40
Mean ± SD	109.77 ± 6.81 mg/dl	

Table-II: Percentage of women according to plasma glucose levels (n=285).

Perinatal Outcome	Frequency (%)	
	Yes	No
Macrosomia	22 (7.72%)	263 (92.28%)
Large for gestational age	78 (27.37%)	207 (72.63%)
Birth asphyxia	65 (22.81%)	220 (77.19%)

Table-III. Perinatal Outcome in pregnant diabetic women (n=285)

Perinatal Outcome		100-139mg/dl (n=167)		≥140mg/dl (n=118)		P-Value
		Frequency	%age	Frequency	%age	
Macrosomia	Yes	06	3.59	16	13.56	0.002
	No	161	96.41	102	86.44	
Large for Gestational age	Yes	27	16.17	51	43.22	0.001
	No	140	83.83	67	56.78	
Birth asphyxia	Yes	24	14.35	41	34.75	0.001
	No	143	85.63	77	65.25	

Table-IV. Comparison of Perinatal outcome between low and high plasma glucose levels (n=285).

DISCUSSION

The rates of complicated outcomes in diabetic mothers can be reduced due to various advances in the previous decade. Such advances consists of continuous glucose monitoring[7], insulin analogs[6] and establishment of preconception clinics. There is not enough data to support the evidence of improvement regarding serious outcomes in pregnant women having diabetes. The two studies, one from Germany (data up to 2004) and other from U.K. (data up to 2007), have searched the trends of serious outcomes during last decade in diabetic mothers. No significant decrease in congenital anomalies or perinatal mortality noted in these studies.[8,9] We have conducted this study in pregnant diabetic women to evaluate frequency of perinatal outcomes.

Our study ranges women with 25-40 years age and mean age 29.44 ± 6.01 years. Most of the patients 109 (38.25%) were between 25 to 30 years. Demographic data of another local study[17] with 110 patients (73.6% had GDM & 26.3% had established DM) resembles with our study. 41 (37.2%) women were 20-30 years of age and 58(52.7%) belonged to 31-35 years age population.[17] In our study perinatal outcome i.e. macrosomia, large for gestational age (LGA) infants and birth asphyxia was found in 7.72%, 27.37% and 22.81% respectively. Pregnant women with mean plasma glucose of 100-139 mg/dl showed frequency of macrosomia by 3.59%, large for gestational age 16.17% and birth asphyxia 14.35% while women with mean plasma glucose of ≥140 mg/dl showed frequency of macrosomia by 13.56%, large for gestational Age 43.22% and birth asphyxia 34.75%.

Haider G, Zehra N, Anjum F et al[17] study revealed 41.8% (46) neonates were LGA whereas 3.6% (04) were SGL (small for gestation age) due to poor glycemic control of mother during pregnancy. Out of 73(66.3%) new borns, 14 (12.7%) had severe while 23 (20.9%) had moderate asphyxia at birth. In this study, 06 newborns were stillbirth.

Hosamane US and his associates has found in a study that pregnant women with mean plasma glucose of 100-139 mg/dl showed frequency of macrosomia by 3.1%, Large for Gestational Age 9.4% and birth asphyxia 12.5% while women with mean plasma glucose of ≥140 mg/dl showed frequency of macrosomia by 6.6%, Large for Gestational Age 26.7% and birth asphyxia 20%.[10] Banerjee S and his associates has found in another study that pregnant women with mean plasma glucose of 100-139 mg/dl showed frequency of Large for Gestational Age by 0% and birth asphyxia 4.16% while women with mean plasma glucose of ≥140 mg/dl showed frequency of Large for Gestational Age 20% and birth asphyxia 18.18%.[11]

The women with pregestational diabetes have 3.5–4.5 times greater rates of macrosomia to infants born in comparison to nondiabetic mothers.[14] 70% macrosomias are related to genetic factors, some syndromes and prolonged pregnancies[12] whereas 30% Macrosomias corresponds to children of diabetic mothers. These 30% macrosomias classically have greater growth of abdomen and shoulders in relation to head.[13] This dysmorphism raises the risk of many obstetric complications (higher rates of Cesarean section, chorioamnionitis, shoulder dystocia, postpartum hemorrhage and extensive perineal

lacerations).[14]

According to Wahabi HA, Fayed A, Esmaeil SA study, out of 3413 deliveries only 3157 met the study criteria. 685 were total deliveries for diabetic women out of the study population. 83.1% (569) had GDM and 16.9% (116) had PGDM. PGDM mothers had heavier neonates and threefold increased frequency of macrosomia in comparison with GDM group, p<0.001. The estimated risk of preterm delivery (< 37 gestation weeks) elevated for PGDM mothers.[15]

Johns K, Olynik C, Mase R et al study revealed that there was 15.5% incidence of Large for Gestational Age (LGA) in GDM women than 5.0% in controls (P < 0.005). Moreover, a higher LGA newborns incidence in women treated with insulin than those managed only with diet (18.8% vs. 14.6%, P < 0.05). 13.2% Macrosomic babies (> 4000 g at birth) born to GDM women vs 5.0% in control population (P < 0.05).[16]

During first few days of life there is high risk of some biochemical complications (hypoglycemia, hypocalcemia and hyperbilirubinemia) in infants of diabetic mothers. In Sheikh Zayed Hospital Lahore study, hypoglycemia (45%) and hypocalcemia (7%) were observed whereas 29% neonates developed respiratory distress syndrome and asphyxia.[18]

CONCLUSION
Pregnant diabetic women with high plasma glucose levels have significantly high percentage of large for gestational age, birth asphyxia and macrosomia as compared to diabetic mothers with low plasma blood glucose levels. Consider diabetic mothers at risk and implement efficacious treatment in order to reduce the perinatal complications. Public awareness programmes should be arranged on national and regional levels focused at educating and counseling of pregnant women for regular antenatal monitoring and good glycemic control.
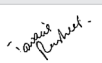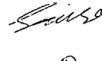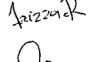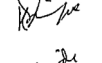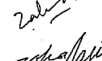**Copyright© 04 Aug, 2020.**

REFERENCES
1. Metzger BE, Gabbe SG, Persson B, Buchanan TA, Catalano PA, Damm P, et al. **International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy.** Diabetes Care. 2010; 33:676–82.

2. Ali S, Dornhorst A. **Diabetes in pregnancy: Health risks and management.** Postgrad Med J. 2011; 87:417–27.

3. Landon MB, Spong CY, Thom E, Carpenter MW, Ramin SM, Casey B, et al. **A multicenter, randomized trial of treatment for mild gestational diabetes.** N Engl J Med. 2009; 361:1339–48.

4. Cheng YKY, Lao TT. **Fetal and maternal complications in macrosomic pregnancies.** Res Rep Neonatol. 2014; 4:65–70.

5. Kamana KC, Shakya S, Zhang H. **Gestational diabetes mellitus and macrosomia: A literature review.** Ann Nutr Metab. 2015; 66(suppl 2):14-20.

6. Mathiesen ER, Hod M, Ivanisevic M. Detemir in Pregnancy Study Group. **Maternal efficacy and safety outcomes in a randomized, controlled trial comparing insulin detemir with NPH insulin in 310 pregnant women with type 1 diabetes.** Diabetes Care 2012; 35:2012–17.

7. Murphy HR, Rayman G, Lewis K. **Effectiveness of continuous glucose monitoring in pregnant women with diabetes: Randomized clinical trial.** BMJ. 2008; 337:a1680.

8. **Report of the expert committee on the diagnosis and classification of diabetes mellitus.** Diabetes Care. 1997; 20:1183–97.

9. Rother KI. **Diabetes treatment—bridging the divide.** The New England J of Med. 2007; 356(15):1499–501.

10. Hosamane US, Malhotra S, Narang A, Dhall K. **Perinatal outcome in relation to maternal glycaemic control in diabetic mothers.** Indian J Med Res. 1990; 92:216-9.

11. Banerjee S, Ghosh US, Banerjee D. **Effect of tight glycaemic control on fetal complications in diabetic pregnancies.** J Assoc Physicians India. 2004; 52:109-13.

12. Susa JB, Lang O. **Macrosomia: Lessons from animal and clinical studies.** Diabetes Rev. 1996; 4(11):11-20.

13. Mello G, Parretti E, Mecacci F, La Torre P, Cioni R, Cianciulli D, Scarselli G. **What degree of maternal metabolic control in women with type 1 diabetes is associated with normal body size and proportions in full-term infants?.** Diabetes Care. 2000; 23:1494-1498.

14. Negrato CA, Montenegro RM, Mattar R, Zajdenverg L, Francisco RP, Pereira BG, et al. **Dysglycemias in pregnancy: From diagnosis to treatment. Brazilian consensus statement.** Diabetol Metab Syndr. 2010; 2 (27):5-14.

15. Wahabi HA, Fayed A, Esmaeil SA. **Maternal and perinatal outcomes of pregnancies complicated with pre-gestational and gestational diabetes mellitus in Saudi Arabia.** J Diabetes Metab 2014; 5:399.

16. Johns K, Olynik C, Mase R, Kreisman S, Tildesley H. **Gestational diabetes mellitus outcome in 394 patients.** J Obstet Gynaecol Can 2006; 28(2):122–27.

17. Haider G, Zehra N, Anjum F, Aftab A. Munir. **Perinatal outcome in diabetic mothers at Isra University Hospital.** Isra Med J. 2009; 1(1):8-12.

18. Aslam M, Baloch GR. **Clinical spectrum of infants of diabetic mothers in hospitalized deliveries at Lahore.** Pak Paediatr J. 2014; 25(1):5-8.

AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Jawaria Rasheed	Conception and design, acquisition of data, analysis and interpretation of data drafting and critical revision, Final approval of the version to be published	
2	Saira Isa		
3	Faizza Rasheed	Analysis and interpretaion of data, Drafting and critical revision.	
4	Kashif Siddiq	Analysis and interpretation of data, drafting and critical revision.	
5	Zahida Saqlain	Acquisition of data and interpretation of data.	
6	Zoha Nasir	Analysis and interpretation of data and drafting.	