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Original Research Article

A prospective study of diabetes in pregnancy and its impact on pregnancy outcome

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ABSTRACT

Background: Diabetes complicating pregnancy has become common worldwide. However due to advances in the management of diabetes and its complications, there has been an overall improvement in the maternal and perinatal outcome. Diabetes occurs quite often during pregnancy even in unsuspected cases which can be either pregestational diabetes mellitus or gestational diabetes mellitus. Our objective was to study the impact of diabetes on pregnancy outcome.
Methods: A prospective observational study was conducted at department of obstetrics and gynaecology of a tertiary care centre over a period of 18 months (January 2019 to June 2020).
All patients were subjected to detailed history and clinical examination followed by relevant investigations such as complete blood count, blood sugars, HbA1C, renal function test, liver function test, urine albumin/sugar/ketones including ultrasonography obstetrics, congenital anomaly scan and doppler study of uterine and umbilical artery.
All the data was compiled in Microsoft excel-sheet and was subjected to appropriate statistical tests.
Results: Incidence of diabetes was found to be 9.72 % in our study population which included gestational diabetes mellitus (77/107) as well as overt diabetes (30). Diabetes was found to be more common in overweight and obese patients (75.7%). Macrosomia (19.6%) followed by polyhydramnios (15.6%) was the most common complication seen in pregnancy complicated by diabetes. Most common neonatal complication seen was hyperbilirubinemia 19(17.75%) and respiratory distress 18 (16.82%) in babies born to diabetic mother.
Conclusions: Pregnant women with diabetes have more maternal, fetal, and neonatal complications, with overt diabetic group being more prone to complications.

Keywords: Overt diabetes, Gestational diabetes mellitus, Macrosomia, Polyhydramnios, Hyperbilirubinemia, Respiratory distress

INTRODUCTION

Diabetes mellitus is a disorder of carbohydrate metabolism. It is caused by a combination of hereditary and environmental factors, and is characterized by either inadequate secretion or inadequate action of insulin. Diabetes complicating pregnancy has become common worldwide. However due to advances in the management of diabetes and its complications, there has been an overall improvement in the maternal and perinatal outcome. Diabetes occurs quite often during pregnancy even in unsuspected cases which can be either pregestational diabetes mellitus or gestational diabetes mellitus. The world prevalence of diabetes among adults was around 6.4% in 2010 affecting 285 million adults and has been estimated to increase up to 7.7% and 439 million adults by 2030.[1] Abnormal maternal glucose regulation occurs in around 3%-10% of pregnancies. The prevalence of

gestational diabetes is around 18 % derived from a recent study using newer cutoffs and data correlating with adverse outcomes.[2] The International Diabetes Federation (IDF) appraises that one out of six live births (16.8%) are to women with some type of hyperglycemia in pregnancy. While 16% of these cases might be because of diabetes in pregnancy (either distinguished during testing in the record pregnancy), the dominant part (84%) is because of gestational diabetes mellitus (GDM).[3]

Objectives

Objectives of current study were; to study the impact of diabetes on pregnancy outcome in form of pregnancy complications- abortion, stillbirths, intra uterine fetal demise etc., Maternal outcome-retinopathy, nephropathy, neuropathy, ketoacidosis, urinary tract infection, wound infection etc., fetal outcome- neonatal intensive care unit admission, birth injury, macrosomia, congenital anomalies etc., labor outcome- mode of delivery: vaginal/ instrumental/caesarean.

METHODS

A prospective observational study was conducted at department of obstetrics and gynaecology of a tertiary care centre over a period of 18 months (January 2019 to June 2020).

Procedure

All antenatal women, except who were already diagnosed, were subjected to DIPSI Method: 75g oral glucose challenge test (OGCT) at their first booking visit and Blood sugar 2-hours post glucose (75g) >140 mg/dl were diagnosed as GDM. Fasting and post-prandial blood sugars were collected at first booking visit in patients who were already diagnosed to be diabetic.

Inclusion criteria

Patients with pre-gestational diabetes or first time diagnosed with diabetes in pregnancy, having regular visits at the department of obstetrics and gynecology, at tertiary care centre. Women with ANC registration outside and has presented in emergency with diabetic/obstetric complications were also included in our study.

Exclusion criteria

Women with hyperglycemia of any other origin such as secondary to cushings syndrome, tumors etc., with history of intake of drugs that affect glucose metabolism like corticosteroids and patients who had given negative consent were excluded from our study.

Data collection and analysis

Antenatal cases, who are registered in hospital from January 2019 to June 2020, who were either subjected to FBS and PPBS in already diagnosed case of diabetes mellitus or were subjected to DIPSI Method: 75g oral glucose challenge test (OGCT) at their first booking visit and were diagnosed to be GDM, were evaluated and managed and formed the study group. Pregnant patients who fulfilled the inclusion criteria were followed up till delivery and 6 weeks post-delivery. All patients were subjected to detailed history and clinical examination followed by relevant investigations such as complete blood count, blood sugars, HbA1C, renal function test, liver function test, urine albumin/sugar/ketones including ultrasonography obstetrics, congenital anomaly scan and doppler study of uterine and umbilical artery. All the data was compiled in Microsoft excel-sheet and was subjected to appropriate statistical tests.

RESULTS

Incidence of diabetes was found to be 9.72% in our study population which included gestational diabetes mellitus (77/107) as well as overt diabetes (30). Age of patients ranged from 18 to 45 years. There were 2 patients (1.86%) in <20 years. There were 15 patients (14%) between 21-25 years, 32 (29.9%) in age group 26-30 years, 45 (42 %) between 31-35 years, 10 (9.34%) between 36-40 years and 3 (2.8%) were >40 years.

Table 1: Distribution according to age (years).

Age Group (years)	Gestational diabetes mellitus	Pregestational diabetes	Total	%
<20	02	0	2	1.86
21-25	12	03	15	14
26-30	27	05	32	29.9
31-35	32	13	45	42
36-40	03	07	10	9.34
>40	01	02	3	2.8
Total	77	30	107	100

Table 2: Distribution according to Body mass index (kg/metre^2).

BMI (kg/metre$^{2)}$	GDM, N (%)	Overt N (%)	Total N (%)
Below 18.5	0	0	0
18.5-24.9	20 (25.9)	6 (20)	26 (24.29)
25.0-29.9	45 (58.4)	16 (53.3)	61 (57)
30.0 and above	12 (15.6)	8 (26.6)	20 (18.69)
Total	77	30	107

Total 26 (24.29%) cases belonged to normal body mass index (18.5-24.9). 61 (57%) cases were in overweight group (25.0-29.9) and 20 (18.69%) cases were in obese group. Diabetes was found to be more common in overweight and obese patients (75.7%). Total 29 (27.1%) pregnant women in the study population had other risk factors such as previous macrosomia, history of GDM, previous unexplained fetal/neonatal loss/still birth,

previous anomalous fetus. 17 (15.88%) pregnant women had history of GDM.

Table 3: Distribution according to birth weight of neonates.

Birth weight (kg)	GDM	Overt	Total	%
<2.5	20	2	22	21.56
2.5-3.5	40	11	51	50
>3.5	17	12	29	28.43

Table 4: Distribution according to gestational age at birth of neonates.

Gestational age (weeks)	GDM	Overt
>34	0	0
34-37	7	3
37-40	65	22
>40	5	1

Table 5: Neonatal complications in our study.

Complications	GDM	Overt
Hypoglycemia	5	4
Respiratory distress	14	4
Hyperbilirubinemia	14	5
TTN	2	-
MAS	5	3
Polycythemia	-	-
Congenital Anomaly	7	6
Birth Injuries	1 (Humerus Fracture)	-
Neonatal death	1	-

Macrosomia (19.6%) followed by polyhydramnios (15.6%) was the most common complication seen in pregnancy complicated by diabetes. In our study, pregnancy complications were observed more with overt diabetes as compared to GDM. The incidence of polyhydramnios was 26.7% in overt diabetes group as compared to 15.6% in GDM group. Macrosomia was seen in 23.3% of patients with overt diabetes as compared to 16.89% in GDM. Overall rate of lower segment cesarean section was 35% in our study population and vaginal delivery rate was 61%. Neonatal characteristics in the study population.

Around 9% and 11.5% neonates were born pre-term in GDM and Overt diabetic group respectively. All neonates born to diabetic mother were admitted in neonatal intensive care unit for blood sugar monitoring for first 24 hours. Most common neonatal complication seen was hyperbilirubinemia 19 (17.75%) and respiratory distress 18 (16.82%) in babies born to diabetic mother. 9 (8.4 %) neonates had hypoglycemia in first 24 hours of delivery. 8 (7.47 %) neonates had meconium aspiration syndrome. 7 (6.86%) had congenital anomaly which included VSD, spina bifida, meningocele, cleft lip and palate, multiple anomalies etc. 2 (1.86%) of the newborns had transient tachypnoea of neonates. 1 (0.93%) neonate had birth injury and 1 (0.93%) neonatal death had occurred. A strong association was seen between higher birth weight (>3.5 kg) and diabetes in pregnancy in our study (p value=0.01968). Around 9% and 11.5% neonates were born at gestational age >34 weeks in GDM and Overt diabetic group respectively.

Table 6: Pregnancy complications in diabetic cases in various studies

Pregnancy complications (%)	Wahi et al[4]	Kalra et al[5]	Bener et al[6]	Capula et al[7]	Present study
Pre-eclampsia/ Gestational hypertension/ Chronic hypertension	6.5	27	19.1	3.9	22
Premature rupture of membrane	1.61	18.1	15.3	-	5.19
Polyhydramnios	-	-	-	3.6	15.6
Urinary tract infection	-	-	24.4	-	23.37
Post-partum hemorrhage	2.8	21	-	-	6.49
Pre-term delivery	-	-	19.8	6.1	10
Wound infection	-	-	-	-	6.49
Vaginal candidiasis	-	24.2	-	-	-

Table 7: Delivery outcomes in diabetic cases in various studies.

Delivery outcome (%)	Wahi et al[4]	Kalra et al[5]	Bener et al[6]	Capula et al[7]	Present study
Cesarean section	15.2	79	27.9	40.5	35
Instrumental delivery (vacuum)	-	3	-	-	4
Shoulder dystocia	5.3	3	-	0.14	0.98
Post-partum hemorrhage	2.8	21	-	-	6.49
Perineal tear					14
Prolonged labor					8.41
Second stage arrest					6.54

Table 8: Neonatal outcome in diabetic cases in various studies.

Neonatal outcome (%)	Wahi et al[4]	Kalra et al[5]	Bener et al[6]	Capula et al[7]	Present study
Macrosomia	9.8	18	10.3	11.3	19.6
Hypoglycemia	-	9.1		0.8	8.4
Respiratory distress	1.5	-		1.8	16.82
Hyperbilirubinemia	-	12.1	12.6	2.4	17.75
TTN	-	-		2.2	2
MAS	-	-		-	7.47
Polycythemia	-	-		1.2	-
Congenital Anomaly	-	-	3.4	-	6.86
Birth Injuries	-	-	8	-	0.93
Stillbirths	2.3	9.1		-	0.93
Neonatal death	-	-		-	1.29

All neonates born to diabetic mother were admitted in neonatal intensive care unit for blood sugar monitoring for first 24 hours. Most common neonatal complication seen was hyperbilirubinemia 19 (17.75%) and respiratory distress 18 (16.82%) in babies born to diabetic mother. 9 (8.4 %) neonates had hypoglycemia in first 24 hours of delivery. 8 (7.47 %) neonates had meconium aspiration syndrome. 7 (6.86%) had congenital anomaly which included VSD, spina bifida, meningocele, cleft lip and palate, multiple anomalies etc. 2 (1.86%) of the newborns had transient tachypnoea of neonates. 1 (0.93%) neonate had birth injury and 1 (0.93%) neonatal death had occurred.

Treatment during antenatal period

In GDM group 31 (40.2%) patients were managed by medical nutritional therapy only. 18 (23.3%) patients were managed by oral hypoglycemic drugs i.e., metformin and 20 (25.9%) were managed by insulin. 8 (10.3%) of patients required metformin and insulin both for glycemic control. Among overt diabetic population, most of the patients i.e., 20 (66.6%) required insulin for glycemic control.

DISCUSSION

In present study, gestational hypertension and pre-eclampsia was seen in 22% cases which was similar to observations of Kalra et al and Bener et al.[7] The observed variations in various studies is mainly due to differences in the sample size of the study, presence of certain risk factors in the study population and treatment given to patients. Dashe et al based on a study in parkland hospital concluded that, "the amniotic fluid index parallels the amniotic fluid glucose level among women with diabetes. So, there is a possibility that the polyhydramnios associated with diabetes is a result of increased glucose level in amniotic fluid."

Operative delivery (cesarean section) and instrumental (forceps) assisted delivery had significant association with diabetes in pregnancy with p value=0.03. Rate of cesarean delivery in our study was 35% which is comparable to other studies. Other intra-partum complications observed were perineal tear (14%), prolonged labor (8.41%), IInd stage arrest (6.54%), post-partum hemorrhage (6.49%) and shoulder dystocia (1%).

Most common complication seen was macrosomia (19.6%) followed by hyperbilirubinemia (17.75%). Similar observations were made in other studies like Kalra et al, Bener et al as well.[7]

CONCLUSION

As per our study, pregnant women with diabetes have more maternal, fetal, and neonatal complications with overt diabetic group being more prone to complications.

Recommendations

Considering India, a developing country with less resources and increasing incidence of diabetes, there should be early diagnosis of diabetes in order to prevent maternal and fetal mortality and morbidity. Universal screening for diabetes in pregnancy is highly recommended with tight control of sugars with a multidisciplinary approach. Diabetes in pregnancy should be managed by obstetrician, physician, and endocrinologists. Biochemical markers, early anomaly scan, fetal 2d-echo should be done to detect anomalies in fetus. They should be closely monitored for adequate sugar control and for fetal well-being by periodic ultrasonography, biophysical profile, non-stress test, daily fetal kick count etc. Patients should be counselled about diabetic diet, self-glucose monitoring, self-administration of insulin, home blood pressure monitoring etc. Pre-conceptional counselling and tight control of sugars should be done in diabetic women trying to conceive.

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