Complications of pregnancy and foetal outcomes in pregnant diabetic patients managed in a tertiary hospital in Saudi Arabia

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Summary

Objective- **To compare the pregnancy complications and fetal outcomes in pregnancies complicated by diabetes mellitus.**

Design- **A retrospective cohort study.**

Setting- **Abha Maternity Hospital, Abha, Saudi Arabia.**

Materials and Methods- **One hundred and eighty five diabetic pregnant patients who delivered at the Abha Maternity Hospital during the 3-year-period from April 2000-March 2003 formed the subjects of this study. There were 27(14.6%) (type 1) - insulin dependent diabetics, group 1, 19 (10.2%)(type 2), non insulin dependent diabetic patients who constituted group 2 and 139(75.2%) gestational diabetic patients who made up group 3. Data extracted from the case files included maternal age, gravidity, parity , number of abortions, gestational age at booking, time of diagnosis of diabetes mellitus, complications during pregnancy, birth weight, placental weight.**

Results- **There were no statistically significant differences in the three groups regarding the mean gravidity, parity, birth weight and placental weight (p>0.05). However, statistically significant differences were found with respect to the mean maternal age, gestation at booking, fasting blood sugar, and gestation at delivery (p<0.05). Out of 139 gestational diabetics, 23(16.5%) were diagnosed by the 14th week of pregnancy while 24(17.2%) were diagnosed between the 15- 27 weeks of gestation. The control of blood sugar was adjudged to be poor in 32% of gestational diabetics, 50% of type 2 diabetics and 69% of type 1diabetics, with statistically significant difference between the groups, (p<0.05).**

Although there was statistically significant difference between the groups regarding one of the pregnancy complications(polyhydramnios) (p<0.05), none were found in other complications (p>0.05). The overall caesarean section rate was 48%. The overall perinatal mortality was 5.7%, all the deaths occurred in babies born to patients with gestational diabetes.

Conclusion- **Gestational diabetes accounted for all the fetal losses in this study, while polyhydramnios was the most common antenatal complication which was significantly higher in type 1 diabetics.**

Keywords: ***Pregnancy, Gestational diabetes, Antenatal complications, Foetal outcomes, Saudi Arabia.***

Résumé

Objectif: Comparer une complication conséquence d'une grossesse et complication des grossesses provoquées par diabète pancréatique son effet sur le foetus.

Plan: Une étude cohorte rétrospective.

Cadre: Maternité d'Abha, Abha, Arabie Saoudite.

Matériels et Méthodes: Cent quatre-vingt cinq patientes enceintes diabétiques ont mis des enfants au monde dans la maternité d'Abha pendant une durée de 3 ans d'avril 2000 au mars 2003 est l'objet de cette étude. Il y avait 27 soit 146% (type 1) patientes insulinodépendants diabètiques groupe 1, 19 soit 10,2% (type 2), groupe composé des patientes non-insulinodépendants diabétiques et groupe 3 composé des 139 soit 75,2% patientes diabétiques gestationnelles. Les données tirées des dossiers des cas sont les suivantes: âge maternel, gravidité, parité, nombre d'interruptions de grossesse, âge de gestation pendant inscription, temps diagnostic des diabètes pancréatique, complications pendant la grossesse, poids de naissance, poids de placenta.

Résultats: Il n'y avait aucun écart statistique important dans les trois groupes en ce qui concerne la moyenne de gravidité, parité, naissance et poids de placenta (P > 0,05). Toutefois, on a noté des écarts statistiquement importants en ce qui concerne l'âge maternel moyen, gestation pendant l'inscription, diète glocuse sanguin, et gestation pendant accouchement (p <0.05). Parmi 139 cas des diabétiques gestationels, 23 soit 16,5% ont été diagnostiqué à la 14 ieme semaine de la grossesse tandis que 24 soit 17,2% ont été diagnostiqués entre 15 - 27 semaines de gestation. On a déclarer que le contrôle du glucose sanguin était mauvais en 32% des diabétiques gestationelles, 50% des diabétiques types 2 et 69% des diabétiques type 1 avec un écart statistiquement important entre les groupes (P <0,05).

Bien qu'il y ait un écart statistiquement important entre les groupes pour ce qui est de l'une des complications conséquence de grossesse (polygydramnios) (P < 0,05), on n'arrive pas à trouver aucun dans d'autres complication (P > 0,05).

Dans l'ensemble, le taux de césarienne était 48%. En général, la, ortalité périnatale était 5,7% tous les morts sont arrivées chez les bebés accouchés par des patientes atteintes du diabète gestationel.

Conclusion: Diabète gestationel constitue la cause pour toutes les pertes foetus dans cette étude tandis que le polyhydramniose était la complication anténatale la plus fréquente qui était remarquablement plus élevée chez les diabétiques type 1.

Introduction

One of the targets set at the St Vincent's Declaration was to improve the pregnancy outcome in women with diabetes, so that the risks of complications approached those of the non-pregnant population.[1] The strategies to achieving these targets include attempts to improve uptake of pre-pregnancy counseling, wider use of meters for home blood glucose monitoring and the development of specific treatment guidelines[2].

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However, Platt et al[3] ,in their study showed dismal and disappointing pregnancy outcomes in diabetic women within the UK where the level of awareness is near optimal and multidisciplinary approach to the management of these women is the norm. Other reports[4] reiterated that in women with diabetes that predates pregnancy, strict metabolic control started before pregnancy is beneficial in reducing pregnancy complications. Gestational diabetes however is a heterogeneous entity and includes women with previously undiagnosed diabetes and those with pregnancy -induced glucose intolerance. It has been reported[5,6] that between 40%-66% of cases of the presumed gestational diabetes could be detected during early pregnancy. This study aimed at comparing the pregnancy complications and perinatal outcomes in pregestational diabetic women with those whose diabetes was diagnosed during pregnancy, and therefore labeled as gestational diabetes.

Materials and methods

The hospital records of all pregnant patients with diabetes who had their delivery conducted at the Abha Maternity Hospital during the period April 2000- March 2003 were retrieved from the labour ward delivery book. There were a total number of 12195 deliveries during the study period out of which 185 (1.51%) were from diabetic mothers. Data extracted from the case records included maternal age, gravidity, parity, number of abortions, booking status, type of diabetes, type of treatment during pregnancy, fasting blood sugar and post prandial blood sugar. Other data were complications during pregnancy, gestational age at delivery, mode of delivery, birth weight, placental weight, Apgar score at 5 minutes and perinatal outcomes. The data were coded, tabulated and entered into an IMB compatible computer. Statistical analyses were carried out using the Statistical Package for Social Sciences (SPSS) v10. Simple ANOVA test was used to compare means of quantitative variables while the chi-square test was used for qualitative data. The level of significance was set at 0.05%

They were 185 women in all made up of 27 (14.6%) patients with insulin dependent diabetes mellitus (IDDM)-(group 1), 19(10.2%) women with non-insulin dependent diabetes-(NIDDM) (group 2) and 139 (75.2%) gestational diabetes(GD) women-(group 3). Booked patients were managed by both the diabetologist and the obstetrician during the pregnancy. At the booking antenatal clinic, all patients with random blood sugar of >140mg/dl were subjected to a 75 gm oral glucose tolerance test (OGGT).Gestational diabetes was considered if two or more values met or exceeded the following cutoff points: fasting,105mg/dL; 1hour, 190mg/dL;2hours,165mg/dL; and 3 hours,145mg/dL. Those patients with abnormal OGGT were referred to the diabetologist who started the patients on diet alone or a combination of diet and insulin. Patients who were already on insulin before pregnancy were automatically started on insulin while the non-insulin diabetics would have either diet alone or a combination of diet and insulin. The patients were regularly followed up at both antenatal and diabetic clinics and were admitted either for pregnancy complications or poor control of diabetes. Poor glycaemic control was based on blood sugar results which were done at the outpatient clinic and also patient's compliance to treatment and attendance at the antenatal clinic. The policy was to allow pregnancy continue to term and have a delivery conducted by the expected date of confinement (EDC) if there were no complications. Caesarean section was done for obstetrical indications only.

Results

The maternal characteristics and some fetal data are shown in table 1. There were no statistically significant differences between the groups regarding the mean parity, maternal weight at booking, birth weight , placental weight and the post prandial blood sugar ($p>0.05$). However, statistically significant differences were discovered in the mean maternal age, fasting blood sugar and gestation at delivery ($p<0.05$).

Antenatal, labour and delivery characteristics are shown in Table 2. Polyhydramnios was the most common antenatal complication observed in 21 patients (11.3%) followed by pre-eclampsia (10.8%). Although there was statistically significant difference in the rate of polyhydramnios among the groups ($p<0.05$) none was found between the groups with respect to other pregnancy complications ($p>0.05$).Eighty three (60%) of the gestational diabetics were treated with diet as compared with 1 (3.7%) and 1(5.2%) of types 1 and 2 diabetics respectively ($p=0.00$). No statistically significant differences were found in the rates of induction of labour and caesarean section between the groups, ($p>0.05$). Neonatal morbidity and mortality are shown in Table 3. Although the perinatal mortality was 57/1000 in the gestational diabetes group, no statistically significant difference was found between the groups. Equally, no statistically significant difference was found in the babies from the mothers in the 3 groups with regards to low Apgar score (<7 at 5 mins) . Ambiguous genitalia was the most common congenital malformation among the babies, 4 from the mothers with gestational diabetes, 2 from type 2 diabetics and none in type 1 diabetic group. No statistically significant difference was

Table 1 Maternal and fetal characteristics

Characteristic	Group 1 N= 27	Group 2 N=19	Group 3 N=139	pvalue
Maternal age (yrs) (X ± SD)	(30.5 ± 7.4)	(36.0 ± 3.2)	(33.0 ± 5.4)	0.008*
Parity (X ± SD)	(3.7 ± 2.9)	(5.2 ± 2.4)	(4.2 ± 2.9)	0.24
Gestation at delivery (wks)(X± SD)	(37.9 ± 0.9)	(38.1 ± 1.6)	(38.8 ± 1.5)	0.01
Weight at booking (Kg)(X ± SD)	(78.1 ± 15.1)	(83.0 ± 12.8)	(80.1 ± 17.2)	0.71
FBS. (mg/dl) (X ± SD)	(123.3 ± 20.0)	(112.6 ± 13.9)	(101.5 ± 17.7)	0.00*
PPBS. (mg/dl) (X ± SD)	(178.2 ± 32.3)	(156.6 ± 31.0)	(187.9 ± 28.6)	0.82
Birth wt. (gms) (X ± SD)	(3212.9 ± 595.6)	(3514.7 ± 694.3)	(3331.7 ± 637.1)	0.33
Placental wt. (gms) (X ± SD)	(585.3 ± 206.5)	(675.0 ± 157.0)	(681.2 ± 155.3)	0.076

SD = Standard deviation *FBS = Fasting blood sugar*
PPBS = Post prandial blood sugar * = *Statistically significant*

Table 2 Antenatal, labour and delivery characteristics

Characteristic	Group 1 N= 27	Group 2 N=19	Group 3 N=139	Significance
Unbooked patients. n (%)	9(33.3)	2(10.5)	31(22.3)	$X^2 = 3.36$ p = 0.186 (NS)
Antenatal complications n(%)				
Pre-eclampsia	4(14.8)	2(10.5)	14(10.0)	$X^2 = 0.53$ p = 0.76(NS)
Polyhydramnious	7(25.9)	3(15.7)	11 (7.9)	$X^2 = 7.70$ p = 0.021
Preterm delivery	0 (0.0)	2(10.5)	4 (2.8)	$X^2 = 4.18$ p = 0.123 (NS)
Urinary infection	0 (0.0)	0 (0.0)	1 (0.7)	$X^2 = 0.33$ p = 0.84 (NS)
Macrosomia	2 (7.4%)	3(15.7)	11 (7.9)	$X^2 = 1.37$ p = 0.50 (NS)
Type of treatment n(%)				
Diet only	0 (0.0)	1 (5.2)	80(57.5)	$X^2 = 40.6$
Insulin	27(100)	18(94.8)	59(42.5)	p = 0.00
Induction of labour n(%)	5(18.5)	(26.3)	34(24.4)	$X^2 = 0.52$ p = 0.77 (N)
Caesarean section n (%)	17(62.9)	10(52.6)	62(44.6)	$X^2 = 3.23$ p = 0.19 (NS)

*NS = Not statistically significant, * = Statistically significant*

Table 3 Perinatal morbidity and mortality

Characteristic	Group 1 N= 27	Group 2 N=19	Group 3 N=139	Significance
Neonatal complication n				
RDS	0	0	1	
TTN	1	0	5	
Hypoglycemia	2	0	2	X2 = 1.8
NNJ	0	0	7	
Hyperbilirubinaemia	0	1	6	p = 0.54 (NS)
Fractures	0	0	0	
Congenital malformation	0	3	7	
Low apgar sore n(%) (< 7at 10min)	1(3.7)	0 (0.0)	2(1.4)	X2 = 1.08 p = 0.58 (NS)
Perinatal mortality n (%)	0(0.0)	0 (0.0)	8(5.7)	X2 = 2.77 p = 0.25 (NS)
Macrosomia (>4000g) n (%)	2(7.4%)	3(15.7)	11(7.9%)	X2 = 1.38 p = 0.50

RDS = Respiratory Distress Syndrome
TTN = Transient tachypnoea of the newborn *NNJ = Neonatal jaundice*

found between the groups with regards to congenital malformation (p>0.05).

Discussion

There is a continuing controversy amongst obstetricians regarding the benefit of routine screening for gestational diabetes. Although some authors[7,8] found little evidence to support universal screening for glucose intolerance during pregnancy, others[9,10] consider gestational diabetes to be a major public health problem associated with higher perinatal mortality and morbidity rates.Recently, Brody et al[11] in their systematic review concluded that there was very limited evidence regarding the potential adverse effects of screening for gestational diabetes. They showed that insulin treatment is probably only beneficial for women with severe degrees of hyperglycaemia in decreasing the incidence of macrosomia, but could not clearly see its effect on maternal and neonatal outcomes.

There is no doubt that the large disparities in access to care and treatment has continued to result in a wide range in the rates of morbidity and mortality. It has been shown that the risk of developing type 2 diabetes in women with gestational diabetes is considerable.[12] Women who remain glucose tolerant after their pregnancy have been found to have a subtle but significant difference from controls in fasting lipids and blood pressure which are predictors of coronary heart disease.[13-15]

In our study, the three groups of patients were similar with respect to parity, maternal weight at booking, birth weight and placental weight but there were differences regarding maternal age, gestational age at delivery and mean fasting blood sugars.

Despite the small sample size and retrospective nature, this study has shown that GD is a major contributor to perinatal death (5.7%) in our community since no deaths occurred in babies born to mothers whose diabetes predated pregnancy, although there was no statistically significant difference between the groups .This result is in contrast with that obtained from another community in the same region by the same authors[16]. This difference may reflect the characteristics of the communities (military vs. civil population) and the type of treatment that was given to the gestational diabetic patients. In this study, about 42% of the gestational diabetic patients received insulin while figures ranging from 34%-86% have been reported by other authors.[17,18] It is therefore postulated that a more liberal attitude towards insulin treatment in gestational diabetic patients may go a long way to reducing the complications during pregnancy. Our study showed that 23 patients (16.5%) of the GD were diagnosed in the first trimester while another 24 (17%) between 15-27weeks. In other reports[5,6] however, 40%-60% of cases of GD were diagnosed during early pregnancy. It has been reported that women with early onset GD are at increased risk of perinatal deaths and pregnancy complications[19]. In this study, 5 (62.5%) of the perinatal deaths occurred in babies whose mothers had GD diagnosed before 20 weeks of gestation. The possibility exists however that some cases of early GD in this study were actually undiagnosed pregestational diabetes. Nevertheless, it has been shown that changes in carbohydrate

homeostasis could start as early as 6 weeks of gestation.[20] It is widely accepted that certain measures such as targeting early delivery, improved compliance, better glycaemic control during pregnancy and improved neonatal care are likely to contribute to improved pregnancy outcomes in diabetic patients. Notably, this excellent outcome was reported by some authors[21] but this outcome is still far from the reach of many communities such as ours. Regarding perinatal morbidity, although there was no statistically significant difference between the three groups, congenital malformation and neonatal jaundice were the most common problems amongst babies of gestational diabetic mothers. Platt et al[3] ,in their study found that the infants of women with type 1 diabetes had 6.4 times the reported risks of congenital malformations and 5.1 times the reported risks of perinatal mortality than infants in the general population. The overall caesarean section rate of 48% in this study falls within figures that have been quoted by other workers[22-23]. The high caesarean section rate in diabetic patients may be explained in part by the high incidence of macrosomia which could make vaginal delivery difficult. In this review, no statistically significant difference was found in the incidence of macrosomia and also in the rate of caesarean section between the groups studied.

Polyhydramnous was the most common antenatal complications in this review and there was statistically significant difference in the rates between the groups studied. This difference may be related to the difference in the mean fasting blood sugars. Nonetheless, it is difficult to explain why other antenatal complications did not reach levels of significance statistically. The overall control of blood sugars in this study was based of the mean fasting and post prandial levels, which showed a statistically significant difference between the groups. In theory therefore, we should have had significantly more complications in patients with type 1 diabetes, with presumably poorest control .It is obvious that estimation of blood sugar levels may not be the most accurate method of assessing adequate control of blood sugar during pregnancy. Therefore the estimation of glycosylated haemoglobin and or fructosamine which has been shown to correlate well with blood sugar control over a period of time should be available and offered to pregnant diabetic patients.[24] Jensen et al.[25] showed that these complications were more common in gestational diabetic patients than non diabetics, it was suggested that tight glucose control during pregnancy would go a long way to reducing these antenatal complications.[21]

Our study has shown that in our community GM is a major contributor of perinatal mortality among diabetes pregnant, while polyhydramnios correlated well with the control of blood sugars in our patients patients.

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