A simplified management of diabetic pregnant woman

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ABSTRACT

Objective: To evaluate a simplified management of diabetic pregnant women.

Methods: A prospective study of the management of all diabetic pregnant women (74) during 2 years from March 1995 - March 1997 was carried out in the Department of Obstetrics & Gynecology, Wad Medani Teaching Hospital, Sudan. Diabetes was diagnosed by an oral glucose tolerance test according to the World Health Organization criteria. Patients were controlled by insulin and monitored by urine for glucose and pre-prandial blood sugar. They were delivered by induction of labor or cesarean section at 38 weeks. Basic resuscitation was carried out for all babies. Intravenous glucose was given to babies when hypoglycemia was diagnosed. Early breast feeding was the rule. Babies who developed complications were managed at the special care unit in the Children's Hospital.

Results: Seventy one patients completed the management, 2 ended in abortion and 69 proceeded to 30 weeks or more. There was one maternal death and 14 perinatal deaths. The main causes of perinatal deaths - Wigglesworth classification - were macerated stillbirth (5), congenital malformation (4) and intrapartum asphyxia (5). A reasonable control of diabetes (pre-prandial 179 or less) was achieved in 56 patients (79%). Seventy percent of the patients were delivered by cesarean section and the main indications were big baby (16 cases) and a previous cesarean section (20 cases). Fifty four percent of all the patients had a history of perinatal death, 28% had a history of repeated abortions and there was a definite family history of diabetes in 53%. Sixty nine percent of the patients were at the age 30 years or more and 50% of them were of the parity 5 or more.

Conclusion: This simplified management of diabetic pregnant women is satisfactory and feasible under our present circumstances. It is hoped that improvement in ante-natal care, delivery care and control of diabetes around the time of conception and care of the newborn will reduce the perinatal mortality rate.

Keywords: Diabetes mellitus, pregnancy, perinatal death.

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Pregnancy alters carbohydrate metabolism but adaptation normally occurs without adverse effects on mother or fetus. The considerable effects of pregnancy on carbohydrate metabolism, particularly the lowered renal threshold for glucose and the diminishing sensitivity to insulin as pregnancy advances renders the control of diabetes more difficult. Before the discovery of insulin in 1921 by Banting and Best, few diabetics conceived, and the incidence of maternal mortality and perinatal mortality (PMR) was very high. After the discovery of insulin, maternal mortality fell dramatically and there was satisfactory reduction in PMR.[1] There is enough evidence now that good control reduces perinatal mortality[2] and that strict glycemic control could eliminate most of the complications of diabetes with pregnancy.[3] The aim of strict glycemic control is to keep the pre-prandial plasma glucose concentration between 80-110 mg/100 ml. Such a degree of control is now achieved by self monitoring at home of capillary blood glucose. Home glucose monitoring is becoming very popular, however this is

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not possible in our community due to lack of measuring apparatus and social, economic and cultural circumstances of our patients.

This study aims to evaluate a simplified management of diabetic pregnant women in Wad Medani Teaching Hospital (WTH) where facilities for good control at home are completely lacking and, moreover, most of the patients live in rural areas which makes follow-up rather difficult. Other problems encountered are the problems of insulin storage at home, the unwillingness of the patients to stay for a long time in hospital and the relatively limited facilities in WTH. Many studies were reported in the literature describing the management of diabetes under favourable conditions but very few were carried out to investigate the management of diabetic pregnant women under conditions similar to ours.

Methods. All patients diagnosed with diabetes mellitus with pregnancy (impaired glucose tolerance was not included) in the department of Obstetrics & Gynecology WTH during the period March 1995 - March 1997 were included. Diabetes mellitus was diagnosed according to the criteria of the World Health Organization (WHO).[4] The glucose tolerance test (GTT) was performed in women with (i) past history of stillbirth or early neonatal death (ii) past history of a baby weighing 4.5 kg or more (iii) history of diabetes in first degree relative (iv) a previous history of a congenitally malformed baby (v) glycosuria in 2 or more occasions (vi) presence of symptoms (vii) hydramnios or macrosomia in the current pregnancy. A standard load of 75 g of glucose in 250 ml water was given after an overnight fast following 3 days of carbohydrate intake. Blood sugar was taken before and at one and 2 hours after the load. Pregnancy was diagnosed clinically or by ultrasound or both. Patients diagnosed diabetic were admitted to the hospital for stabilization. Then a thorough history and examination was performed. Patients were managed jointly by an obstetrician and a physician. All patients were treated with insulin and were advised on diet; no patient was treated by oral hypoglycemic agents for fear of neonatal hypoglycemia. In the hospital, patients were followed up by urine for sugar and ketones 6 hourly and pre-prandial (pre-breakfast and pre-supper) blood sugar twice weekly. Insulin was given by 2 daily injections - soluble and zinc - and the optimum dose was calculated by trial and error; a dose which kept the pre-prandial blood sugar less than 120 mg/100 ml. Patients who developed diabetic ketoacidosis were treated with a loading dose of 40 units of soluble insulin and then 5 units hourly together with a saline infusion until the ketoacidosis disappeared. When the optimum dose of insulin was obtained the patient was discharged home on that dose and was advised to attend the ante-natal clinic (ANC) every 2 weeks and during each visit her condition was evaluated clinically and a pre-prandial blood sugar was carried out. Patients were readmitted to hospital if the diabetes was poorly controlled or if they developed complications. All patients were readmitted to hospital at 34-36 weeks gestation and stayed in hospital until delivery. In the hospital they were followed up clinically and biochemically with pre-prandial blood sugar twice weekly. An ultrasound was performed to estimate the maturity, amount of liquor, presentation, congenital malformation and the site of the placenta. Delivery was planned after 37 weeks - usually at 38 weeks - because the neonatal care services were limited and amniocentesis for L/S ratio was not performed. Patients were never allowed to reach term and those who developed pre-term labor after 34 weeks were not given drugs to inhibit contractions. Pregnancy was terminated by induction of labor or cesarean section. Labor was usually induced by artificial rupture of membranes and an oxytocin infusion starting immediately. Induction was performed at 7 o'clock in the morning. A partogram was used in the management of labor and the fetal heart was monitored throughout labor by a fetal stethoscope. If after 12 hours the progress of labor was not satisfactory, or if there were any other complications during labor, patients were delivered by cesarean section. During labor urine for sugar and ketones and blood sugar were carried out every 2 hours and insulin was given accordingly. Prophylactic antibiotics were given routinely during labor. Elective cesarean section was carried out for patients with; a previous cesarean section, malpresentation, ante-partum hemorrhage, hypertension, big baby, parity of 5 or more, relative infertility or when the diabetes was poorly controlled. After delivery, insulin was given only to those with a blood sugar more than 120 mg/100 ml.

A pediatric registrar usually attended the deliveries, and on a few occasions a consultant pediatrician. Immediately after delivery suction of the upper airways was carried out and oxygen was given by mask to those who could not commence respiration spontaneously and if they failed with the mask, oxygen was given by an endotracheal tube. Apgar score was calculated at one and 10 minutes. The babies were examined and weighed and breast feeding was started half an hour after vaginal delivery and 4-6 hours after cesarean section. All babies had their blood sugar tested 2 hours after delivery; hypoglycemia was defined as a blood sugar less than 30 mg/100 ml and was treated by intravenous glucose. Babies with idiopathic respiratory syndrome or other problems were treated in the special unit in the children's hospital.

Results. The total number of patients included in the study were 74; 3 of them were stabilized on

insulin and discharged home for follow-up in the ANC, but they did not turn up and their outcome of pregnancy was not known. Out of the 71 patients who continued in the study 2 ended in abortion at 18 and 22 weeks and the rest - 69 patients - proceeded to a gestational age of 30 weeks or more. There was one maternal death. She was para 10 admitted with obstructed labor due to big baby (4.9 kg) and was delivered by an emergency cesarean section. Urine analysis at the time of admission revealed 4 crosses of sugar and 4 crosses of ketones, and a diagnosis of diabetic ketoacidosis was made without doing a blood sugar because it was not possible in the middle of the night. She was immediately started on saline infusion, soluble insulin and broad spectrum antibiotics. The fetus was already dead. The patient came from a remote village, never had ante-natal care in her life and was not known diabetic before. Post-operatively she was continued on the same management but it was rather difficult to control her diabetes - blood sugar ranging between 640 to 200 mg/100 ml. She died suddenly on the 7th post operative day and the cause of death was possibly pulmonary embolism according to the clinical picture.

Age, duration of marriage and parity. Table 1 shows the distribution of patients by age. Fifty one out of seventy four (69%) of the patients were at the age of 30 years or more and none of the patients were below 20 years. When the duration of marriage was calculated it was found that all the patients - except one - were married for 3 years or more and that the majority of the patients 51/74 (69%) were married for 10 years or more. Half of the patients 37/74 (50%) were para 5 or more; 32/74 (43%) were in the parity group 1-4 and only 5/74 (7%) were primigravidae. The above mentioned results showed that most of the patients were rather old with a long duration of marriage and a relatively high parity.

Education and residence. Most of the patients 65/74 (88%) had basic education; 2/74 (3%) had higher education and only 7/74 (10%) were illiterate. Almost two thirds 47/74 (63.5%) came from rural settings and 24/74 (36.5%) came from urban settings.

Table 1 - Distribution of patients by age.

Age in years	Number	Percentage
Less than 20	-	-
20 - 24	2	3
25 - 29	21	28
30 - 34	20	27
35 - 39	23	31
40+	8	11
TOTAL	**74**	**100**

Table 2 - Past obstetric history.

Past obstetric history	Number	Percentage
1 Perinatal death	40	54
- still birth	18	24
- early neonatal death	22	30
2 2 or more abortions	21	28
3 Normal obstetric history	26	

Past obstetric history and family history. The past obstetric history of all patients was identified and the main significant problems in relation to diabetes are shown in Table 2. It was found that some of the patients had more than one problem and were included both in group 1 and 2. Forty eight out of seventy four (65%) were found to have a significant obstetric problem in their past history; 40/74 (54%) had a history of perinatal death; 21/74 (28%) had a history of 2 or more abortions. These results show that pregnant women with a past history of perinatal death, or repeated abortion should have a glucose tolerance test carried out. There was a definite family history of diabetes in a first degree relative in more than half the patients 39/74 (53%). Fourty three out of seventy four (58%) of the patients were known diabetic before the current pregnancy and 31/74 (42%) were discovered diabetic for the first time during this pregnancy. In 29 out of the 31 patients who were diagnosed diabetic for the first time during this pregnancy the indication for GTT was glycosuria in 17 patients and bad obstetric history in 12 patients and the other 2 patients were admitted with diabetic ketoacidosis. Even in those 43 who were known diabetic before this pregnancy, 19 of them were diagnosed for the first time during a previous pregnancy and hence the total number of patients who were diagnosed for the first time during a pregnancy were 50/74 (68%).

Outcome of pregnancy. Table 3 shows that a good control of diabetes (pre-prandial less than 120 mg/100 ml) could be achieved in 27 patients and there were 3/27 (11%) perinatal deaths and one abortion in those patients. In 29 patients, the control

Table 3 - Perinatal death in relation to pre-prandial blood glucose.

Preprandial glucose mg/100 ml	Number of patients	Perinatal deaths	Abortion
1. Less than 120	27	3 (11%)	1
2. 120 - 179	29	6 (21%)	-
3. 180 +	15	5 (33%)	1
TOTAL	**71**	**14**	**2**

Table 4 - Perinatal death by Wigglesworth classification.

Wigglesworth classification	Number of deaths	Percentage
Normally formed macerated stillbirth	5	36
Congenital malformation	4	29
Prematurity	1	7
Asphyxial conditions developing during labor	4	29
Other specific conditions	-	-
TOTAL	**14**	**100**

was satisfactory (pre-prandial 120-179) and there were 6/29 (21%) perinatal deaths in that group. In 15 patients the control was poor (pre-prandial 180+) and this group showed the highest PMR 5/15 (33.33%). This table shows that a reasonable control was achieved in 56/71 (79%) and that poor control of diabetes is associated with a high number of perinatal deaths. There were 14 perinatal deaths giving a PMR rate of 14/69 (20%) which is a relatively high rate. The causes of those perinatal deaths were classified according to Wigglesworth classification of perinatal deaths[5] and are shown in Table 4. Macerated stillbirth, congenital malformation and asphyxia during labor were the main causes of perinatal deaths. Two of the congenital malformations were sacral agenesis, the 3rd was a hydrocephalus and the 4th was anencephalic baby. The majority of babies 50/69 (72.5%) were of average weight 2.5-3.9; almost a quarter of the babies 17/69 (25%) were big babies weighing 4 kg or more and only 2/69 (3%) were below 2.5 kg. The mean birth weight for all the babies was 3440 g (Table 5).

Out of the 71 patients in whom the outcome of pregnancy was known, 2 ended in abortion and in 69 patients the pregnancy proceeded to 30 weeks or more. Of those 69 patients 21/69 (30%) were delivered vaginally and 48/69 (70%) were delivered by cesarean section (Table 6). The main indications of cesarean section were big baby (16 cases) and a history of one or more cesarean section (20 cases). Other indications were ante-partum hemorrhage (2 cases), twins (one case) hypertension (3 cases), breech presentation (3 cases) and a parity of 5 or more (3 cases). Out of the 21 patients who were delivered vaginally, 11 started labor spontaneously and the gestational age at delivery was more than 37 weeks in 10 patients and in one patient the gestational age was 35 weeks.

Table 5 - Distribution of babies by birthweight.

Birthweight in kg	Number	Percentage
Less than 2.5	2	3.0
2.5 - 3.9	50	72.5
4+	17	25.0
TOTAL	**69**	**100.0**

Discussion. Seventy four diabetic pregnant women were managed in Wad Medani Teaching Hospital (WTH) using a simplified regimen. Although the hospital had adequate facilities for our simplified management of pregnancy complicated by diabetes, but, for obvious reasons, the patients would never accept to stay in hospital for a long time and they had to continue their management as outpatients. Almost two thirds (63%) of our patients came from rural settings, and they were not able to come regularly to the ante-natal clinic at short intervals. Home glucose monitoring was not possible in this study and hence strict glycemic control was not attempted. There is enough evidence in the literature that good control of diabetes reduces the PMR and that with strict glycemic control the PMR rate is nearly equivalent to that observed in normal pregnancies.[4] Using this simplified management we could achieve a satisfactory glycemic control of diabetes; in 27/71 (38%) the control was good, in 29/71 (41%) the control was satisfactory and in only 15/71 (21%) the control was poor. However, our PMR was high (20%), higher than the PMR in all deliveries in WTH which was found to be 77 per 1000 livebirths[6] and much more higher than the PMR rate among diabetic pregnant women at King's College Hospital during the period 1971-1980 which was found to be 13/352 (4%).[7] Although the inadequate control of diabetes in some patients was certainly a factor in this high PMR, there were other factors which contributed to this high PMR significantly; malformations, asphyxia and prematurity. Among the 14 perinatal deaths there were 4 infants with lethal congenital malformations and that could be due to poor control at the time of conception[8] and none of our patients were adequately controlled at that time. In fact 31 of our patients were diagnosed diabetic for the first time during this pregnancy and even those who were known diabetic before this pregnancy were not properly controlled around the time of conception. Another 4 perinatal deaths were due to asphyxia developing during labor. It is worth mentioning here that intrapartum asphyxia is the main cause of PMR in WTH due to inadequate intrapartum monitoring and unsatisfactory care of the newborn. One perinatal death was due to prematurity and the proper management of such infants requires expensive equipment which our department does not pocess at the present time. Two patients were admitted with diabetic ketoacidosis and intra-uterine foetal death. Those 2 patients were seen for the first time at the time of admission and were not managed

by our simplified management before their fetuses died. In view of what has been mentioned above it could be concluded that our simplified management was satisfactory under our present circumstances and that reduction in PMR requires, in addition to better control, proper managment of labor, adequate care of the newborn and early detection of diabetes mellitus and its control around the time of conception. It is now extremely rare for a diabetic woman to die as a result of pregnancy. There was only one maternal death at King's College Hospital during the period 1971 - 1986.[7] Among our patients studied there was one maternal death which could have been prevented if prophylactic heparin had been given post-operatively, however, that was not the policy of our department for fear of complicatins of anticoagulant therapy. The incidence of cesarean sections among all deliveries in WTH is 20% (WTH Records). In this study 48/69 (70%) of the patients were delivered by cesarean sections; 38 elective and 10 emergency. This incidence is high when compared to that in King's College Hospital which was found to be 52% during the period 1981 - 1985.[7] This high incidence of cesarean sections could be attributed to the fact that 50 per cent of the patients were of high parity - 5 or more, 20 patients had a previous one or more cesarean section, 25% had big babies and 70% were at the age of 30 years or more. Most of our patients were diagnosed for the first time during pregnancy 51/74 (70%), either the current pregnancy or a previous pregnancy. Screening for diabetes during pregnancy in our hospital is rather difficult and hence it is recommended that an oral glucose toleance test should be carried out if there are indications. This study showed that most of our patients had genuine indications in their past history; 40 patients had a past history of stillbirth or early neonatal death, 20 patients had a past history of 2 or more abortions and 17 patients out of the 31 patients who were discovered diabetic for the first time had glycosuria in 2 or more occassions. Also there was a definite family history in first degree relatives in 53% of our patients.

Proper management of diabetic pregnant women is now well understood and proper control improves the outcome of pregnancy significantly. However, the management is influenced by the social and economic conditions of the patients. Our simplified management is satisfactory and suitable for our patients. It is hoped that improvement in ante-natal care, delivery care, care of the newborn and early detection of diabetes will improve the outcome of pregnancy.

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