

Diabetes mellitus during pregnancy. *Fetal outcome*

Saad E. Dafallah, MBBS, MGOK,  
Eisa M. Yousif, MBBS, MSc.

The study was a prospective case-control study carried out in Wad Medani Teaching Hospital Sudan, during the period January 1998 to December 2001. The study included all cases presented to the Department of Obstetrics as being diabetics or having an abnormal glucose tolerance. The controls were selected from the next woman in the registration provided that she was not having an abnormal glucose tolerance. The study group was divided into established diabetes, gestational diabetes and those with impaired glucose tolerance. This was carried out according to the World Health Organization (WHO) classification. All perinatal deaths were recorded and examined in details, and the birth weights were also recorded.

All cases in both groups were then interviewed the day after delivery, detailed information were obtained. Data were recorded on a questionnaire forms and then transcribed to summary sheets. The data were then entered into a computer for analysis.

In the study group, cases were classified into established diabetes, the diagnosis of them was made sometimes before pregnancy and the patients were already on treatment before conception. The second group included those with gestational diabetes in whom the diagnosis was made during pregnancy. The criteria for diagnosis depended on a fasting blood glucose of 8-11  $\mu\text{mol/l}$  and 2 hours after 75 gm glucose meal of 11  $\mu\text{mol/l}$  or more. The third group included patients with impaired glucose tolerance characterized by a fasting blood glucose of 6-8  $\mu\text{mol/l}$  and a 2 hours after 75 gm glucose meal of 8-11  $\mu\text{mol/l}$ .

The study also included the total number of deliveries during the specified period. The variables studied included the ages of mothers, the parity and the gestational age at delivery. The study was also concerned with whether mothers received insulin during pregnancy or not. The birth weights were also measured and recorded. Fresh stillbirths, macerated stillbirths and early neonatal deaths were included.

During the specified period, the data were collected on 660 study cases and 620 controls. The total number of babies born to the study group was 665 and for the controls they were 628. The total numbers of all deliveries during the same period were 21567, giving an incidence of 660/21567 (3%) for abnormal glucose tolerance with pregnancy. Of the 660 cases in the study group 130/660 (19.7%) were established diabetes. Gestational diabetes

constituted 230/660 (34.8%) while the remaining 330/660 (45.5%) were patients with impaired glucose tolerance.

In the group of established diabetes, 118/130 (90.8%) received insulin while the remaining (9.2%) were treated with diet control. In cases with gestational diabetes 155/250 (67.4%) were treated with insulin while the remaining (32.6%) were subjected to diet control. Only 50/300 (16.6%) of patients with impaired glucose tolerance received insulin while diet control was attempted for the remaining 250/300 (83.4%). This gave an overall proportion between insulin users and non-insulin users of 50%.

Table 1 shows the perinatal mortality rate in the control (23.9%) which is similar to the total hospital population (23.7%). The perinatal mortality rate was significantly higher in the diabetic group (80.2%) than the total hospital population (23.7%) ( $p < 0.01$ ). That was explained by the high rate of loss in both established diabetes and gestational diabetes. Expressed as relative risk (RR) the overall perinatal mortality rate in diabetes was 3.5 times that of non-diabetics (95% confidence interval [CI]). The RR for established diabetes was 2.7 while it was 2.0 for gestational diabetes. Unexplained intrauterine deaths were more common in established diabetes (RR=18.4, 95% CI 3.9 to 85.7) and in gestational diabetes (RR 13.4, 95% CI 2.9 to 61.6). The cases with impaired glucose tolerance had no intrauterine death or stillbirth. They had a lower perinatal mortality rate (9.9/1000) than the controls (23.9/1000). That difference is not statistically significant ( $\chi^2 = 9.4$ ).

Babies in the control group are heavier than expected compared with the centile data, with a mean birthweight SD of 0.042 and 3 times as many babies as expected weighing  $> 2$  SD. However, the birthweight was highly significantly greater in cases than in the control both in terms of birthweight  $> 4.5$  kg and birthweight centile. Interestingly, this increase in birthweight was seen also in the group with impaired glucose tolerance, through there were significant differences between study groups. There were no significant differences in any aspect of birthweight depending on whether or not there were treatment with insulin.

It is important to emphasize the limitation, and the advantage of the study design. This is not a total population study, and there may be some bias in referral. There was no systematic screening for glucose tolerance in pregnancy in Gezira province for which Medani is the capital. Definitions of abnormality and treatment were not standardized for clinical management, and the information available in the antenatal notes was often inadequate. Every patient known to be affected were included and followed up scrupulously in the labor ward. The

## Diabetes mellitus during pregnancy

Table 1 - Perinatal mortality.

Group	All deliveries	All babies	Stillbirth per/1000 live births		Early neonatal deaths per /1000 live birth		Perinatal deaths per/1000 births		Unexplained deaths per/1000 births	
			n	(%)	n	(%)	n	(%)	n	(%)
Total hospital population	21567	21813	265	(12.1)	253	(11.5)	518	(23.9)	Not known	
Control	620	628	6	(9.5)	9	(14.3)	15	(23.9)	3	(4.7)
Total cases insulin	321	324	19	(58.6)	7	(21.6)	26	(80.2)	16	(49.4)
No insulin	339	341	3	(8.8)	3	(8.8)	6	(17.2)	3	(8.8)
Total	660	665	22	(33.1)	10	(15)	32	(48.1)	19	(28.6)
Established diabetes insulin	118	118	8	(67.8)	6	(50.8)	14	(118.6)	9	(76.3)
No insulin	12	12	-		-		-		-	
Total	130	130	8	(61.5)	6	(46.2)	14	(107.7)	9	(69.2)
Gestational diabetes insulin	155	157	10	(63.7)	-		10	(19.6)	8	(50.9)
No insulin	75	75	1	(13.3)	-		1	(13.3)	3	(40)
Total	230	232	11	(47.4)	-		11	(47.4)	9	(38.8)
Impaired glucose insulin	50	51	-		1	(19.6)	1	(19.6)	-	
No insulin	250	252	-		2	(7.9)	2	(7.9)	-	
Total	300	303	-		3	(9.9)	3	(9.9)	-	

study showed that there was a high rate of perinatal deaths and big babies, and due to this high rate and size of the study, differences between the groups had been demonstrated. There are few published total population studies of diabetes in pregnancy.

In our study, the incidence of diabetes is 3%. This result is comparable with the total of Bryson et al<sup>1</sup> which is 2.7%. In our study, the distribution of the type of diabetes was 19.7% for established diabetes, 34.8% for gestational diabetes and 45.5% for impaired glucose tolerance. while in Ehrenberg<sup>2</sup> study the distribution was 18.9% for established diabetes 33.9% for gestational diabetes and 47.2% for impaired glucose tolerance. Compared with the controls, the study group had a highly raised perinatal mortality. This could be explained by the poor compliance of many women with suggested dietary and insulin regimens and inadequate medical recommendations for monitoring or elective deliveries. The perinatal mortality rate in our study was found to be 80.2/1000. That result was similar to 97.3/1000 found by Gabbe and Graves.<sup>3</sup> The perinatal mortality was high with established diabetes being 107.7/1000. In gestational diabetes it was found to be 47.4/1000 and it was only 9.9/1000 with impaired glucose tolerance. These results were comparable with the result of LaVallie et al.<sup>4</sup> They found out that the perinatal mortality was 105/1000 in established diabetes, 46.2/1000 in gestational diabetes and only 9.1% in impaired glucose tolerance. Therefore, established diabetes had a perinatal mortality rate nearly 5 times greater the

controls. The rate of unexplained intrauterine deaths was 17 times more common than in the controls (95% CI 3.8 to 84.7). The recent report of Shimizu et al<sup>5</sup> showed a similar result in which the rate of unexplained intrauterine deaths was 16.4 times more than in non-diabetic control.

Received 6th April 2004. Accepted for publication in final form 26th July 2004.

From the Department of Obstetrics and Gynecology (Dafallah), and Department of Primary Health Care and Health Education (Yousif), Faculty of Medicine, University of Gezira, Sudan. Address correspondence and reprint requests to: Dr. Saad E. Dafallah, Associate Professor, Department of Obstetrics and Gynecology, Faculty of Medicine, University of Gezira, PO Box 20, Gezira, Sudan. Tel. +295 (11) 45109. Fax. +295 (11) 43415.

### References

- Bryson CL, Ioannou GN, Rulyak SJ, Critchlow C. Association between gestational diabetes and pregnancy-induced hypertension. *Am J Epidemiol* 2003; 158: 1148–1153.
- Ehrenberg HM, Huston-Presely L, Catalano PM. The influence of obesity and gestational diabetes mellitus on accretion and the distribution of adipose tissue in pregnancy. *Am J Obstet Gynecol* 2003; 189: 944-948.
- Gabbe SG, Graves CR. Management of diabetes mellitus complicating pregnancy. *Obstet Gynecol* 2003; 102: 857-868.
- LaVallie DL, Gabbe SG, Grossman DC, Larson EB, Baldwin LM, Andrilla CH. Birth outcomes among American Indian/Alaska Native women with diabetes in pregnancy. *J Report Med* 2003; 48: 610-616.
- Shimizu I, Makino H, Osawa H, Kounoue E, Imagawa A, Hanafusa T, et al. Association of fulminant type 1 diabetes with pregnancy. *Diabetes Res Clin Pract* 2003; 62: 33-38.