GESTATIONAL DIABETES MELLITUS (GDM): EXCELLENT CONTROL OR NON-DISEASE

D. XUEREB

INDTRODUCTION

When it comes to gestational diabetes mellitus (GDM) the practising obstetrician faces a dilemma which further reading appears impossible to resolve.

On the one hand there is the National Diabetes Data Group (1) making the case for universal screening of the obstetrical population. This has spawned a long retinue of followers, including several prominent members of the American College of Obstetrics and Gynaecology (ACOG). Interestingly, the latter body falls short of recommending universal screening, and suggests instead that screening should be reserved for pregnant women 30 years or older unless they have risk factors (2).

On the other hand there are those who, like Hunter and Kierse (3) have examined the evidence for universal screening and found it lacking. They would have everyone stop universal screening forthwith. Naylor (4) seriously questions the basic Oral Glucose Tolerance Test (OGTT) as far as methodology and assumptions derived therefrom. He suggests giving up the "Dichotomous View" that OGTT is either normal or abnormal and of GDM as either present or absent. He suggests instead a stratification of carbohydrate intolerance into various degrees to which clinical significance is then applied.

Faced with the diametrically opposite views, Landon, et al (5) found in a survey of ACOG members that clinicians practise universal screening. This is not surprising since Garner and Benzie (6) have stated "until a true picture of the maternal fetal risk/benefit ratio is drawn, most centres continue to consider the gestational diabetic at increased risk".

The need for a community-based population study of all social, economic and racial groups was raised by Jacobson and Cousins (7) who acknowledged that all studies came from tertiary-care centres, not necessarily representing the community at large. This is why a group of obstetricians in private practice calling themselves Pregna Obstetrical Associates (Pregna) became interested in universal screening for GDM.

The introduction of the glucose reflectance meter also contributed to our interest in the subject since it offered unprecedented opportunity to control glycaemia in the patients own home. We especially wanted to show if tight glucose control and close fetal surveillance could turn a group of patients with GDM into women with pregnancy risks approaching those of the general population.

METHOD

The study was conducted between January 1, 1987 and May 31, 1990. The setting was a group private practice in the city of North York, Ontario (Pop. 560,000) comprising five obstetricians who pool their patients and work with common protocols. All patients received hospital management, and were delivered, at North York General Hospital - a community hospital of secondary care designation.

The controls were made up of two populations. Control population 'A' comprised all those patients who did not have GDM or insulin dependent diabetes mellitus and were delivered by the obstetrical group during the same time frame. Control population 'B' was made up of all patients, including diabetics of all classes delivered at North York General Hospital during the same period.

At the time of their initial visit, patients were screened for historical high-risk markers for GDM including: previous unexplained perinatal losses, babies with congenital anomalies, babies weighing 4,000 g. or more (macrosomia); also history of gestational diabetes in an earlier pregnancy or a history of diabetes mellitus in first-line relatives. All patients having one or more such markers underwent a screening test for GDM following this visit.

All other patients, and those with high-risk markers for GDM who screened negative initially, had a random 50g. glucose (Glucola) test done to coincide with their

DENNIS XUEREB, MD, FRCS (C)
OBSTETRICIAN & GYNAECOLOGIST,
NORTH YORK GENERAL HOSPITAL,
CANADA

prenatal visit at 24-28 weeks gestation. Plasma glucose level was drawn and those patients with a level of 8m mol/L or higher were considered as positive screens. These patients had a 3-hour 100 g. OGTT following three consecutive days during which their diet included a minimum of 150 g. of carbohydrates daily.

All glucose laboratory tests were carried out at the same private lab using the glucose hexokinase method on a Teknicon RA1000 analyser.

The three hour OGTT included a fasting level drawn after an eight to twelve hour fast, and blood samples drawn at 1, 2 and 3 hours post glucose load. A positive OGTT was one wherein two or more of these values were reached or exceeded:

Fasting:	5.8m mol/L	*plasma glucose*
1 hour:	10.6m mol/L	*plasma glucose*
2 hour:	9.2m mol/L	*plasma glucose*
3 hours:	8.1m mol/L	*plasma glucose*

Patients with a positive OGTT were considered to have GDM and attended the Diabetic Clinic at North York General Hospital where they received instruction over a number of sessions from nurses and nutritionists. They were made aware the possible consequences of their glucose intolerance with respect to their pregnancy. A dietary history was taken and an acceptable diet of 8,500 - 9,000 kJ given. This was to include at least 50% of the total caloric intake as carbohydrate, amounting to some 40 g. per meal.

Self monitoring of blood glucose was taught using one brand of reflectance meter loaned out to the patients. Patients were taught to calibrate the machine and to take 4 finger prick readings daily - fasting, before lunch and supper, and at bedtime. They wrote down the values obtained in a log book which they brought to their prenatal visits for evaluation. Patients were encouraged to phone in or visit the Diabetic Clinic as often as they deemed necessary.

Any patient that had two successive readings, or more than an occasional one of 7m mol/L or higher were considered candidates for insulin therapy. When this decision was made the patients were seen in consultation by an endocrinologist who undertook to supervise the diabetic control until delivery. Novolin insulin usually in split dosage, was used and glycosylated haemoglobin was drawn at every prenatal visit as a double-check on diabetic control.

GDM patients were seen every two weeks from diagnosis to the 34th week of gestation and then weekly until delivery. Those patients under the concurrent care of the endocrinologist visited him as well as the obstetrician on the same day and pertinent information was exchanged. All management related to GDM was carried out on an ambulatory basis. Hospitalization was for obstetrical and/or diabetic complications only.

Fetal surveillance included fetal movement counting by the Sadovsky method (8), and an early second trimester ultrasound mainly for purposes of dating. Ultrasound examinations were repeated only on indication in later pregnancy: eg, polyhydramnios, twins, placenta localization, or macrosomia. From the 34th week of pregnancy onwards, GDM patients had weekly non-stress testing. Since early 1990, biophysical profiles (9) were done more commonly but the NST was the main test of fetal well-being. Patients who went beyond 40 weeks gestation were seen bi-weekly and had NST's every two to three days till delivery.

Patients who showed excellent blood sugar control (3.5 - 7m mol/L) on diet alone, were allowed to go up to 42 weeks gestation in anticipation of spontaneous labour. Beyond 42 weeks intervention occurred. Those patients requiring insulin as well as diet control were delivered at 40 weeks. Other early deliveries were for obstetrical indications.

At delivery the infants went to a transitional nursery where the maternal history of GDM was known. Their care was supervised by the family doctor or paediatrician, with the help of a neonatologist where indicated. Beyond noting major complications, eg., anomalies, respiratory difficulties, and other morbidity, eg., infection or hyperbilirubinaemia, affecting length of hospital stay, the nursery course of the infants was not part of the protocol for this study.

At the six weeks post-partum office visit, all GDM patients were encouraged to have a repeat 3-hour OGTT with a 75g. glucose load. Those patients with a positive test were contacted and advised to make lifestyle changes including diet and weight-loss where indicated. Regular glucose testing under the supervision of the family doctor was encouraged.

RESULTS

Between January 1, 1987 and May 31, 1990, Pregna Obstetrical Associates (Pregna) delivered 3,774 patients. Of these, 147 patients tested positive for GDM, for an incidence of 3.9%. Seven-hundred and twenty-seven (727) patients, 19% had a positive glucose challenge test and 20% of these (147) had an abnormal OGTT.

Of the 147 GDM patients, two moved elsewhere before completing their pregnancy. Thus only 145 patients' histories were fully analysed, although data from 147 were used for epidemiological purposes.

Table I summarizes the patient totals.

The obstetrical population at Pregna draws from all groups of the rich multicultural mix of the region. One group, Orientals, is made up mostly of Chinese from Hong Kong with small percentages of Taiwanese, mainland Chinese, and Vietnamese. According to the 1986 census (Statistcs Canada) North York has between 5%

TABLE I

GESTATIONAL DIABETES MELLITUS (GDM)

Study period: 1 January 1987 - 31 May 1990	
Total Deliveries	n = 3774
GDM Patients	n = 147* (3.9%)
Control Populations:	
"A": Total deliveries less diabetics (All classes) n = 3622	
"B": Total deliveries @ NYGH during study period n = 9435	

*2 patients delivered elsewhere

and 8% Orientals. At Pregna, patients of oriental extraction numbered 672 in the study, ie., 20.5% of the total obstetrical load. Of these 672 patients, 56 or 38% were diagnosed as having GDM.

GDM patient age and parity are shown in table II and III. In table II, one sees a relatively smaller percentage of women under 25 years of age in the study group compared to controls and a higher percentage of women aged 40 years or older. The numbers are too small to allow for statistical analysis.

The parity of the study and control populations were similar. (Table III). A breakdown of the parous women by number of viable pregnancies again failed to show significant differences.

The risk factors for gestational diabetes identified at the first prenatal visit are presented in Table IV. Where patients had more than one risk factor only one was counted. The rates for these historical events were not noted in the control populations.

As noted, only 35% of the GDM population had historical risk factors for GDM. The corollary is that 65% of GDM patients had none. Thus 94 of 3,774, or 2.5% of patients had GDM without any historical markers.

Of 141 GDM patients, 131 were managed by diet alone, whereas 14 or 9.6% required the addition of insulin to

TABLE II

PATIENT AGE

AGE (YRS)	STUDY POPULATION n = 145	CONTROL POPULATION "A" n = 3622
≤ 24	4 (2.8%)	355 (9.8%)
25 - 29	54 (37.2%)	1148 (31.7%)
30 - 34	55 (38.0%)	1456 (40.2%)
35 - 39	27 (18.6%)	605 (16.7%)
≥ 40	5 (3.4%)	58 (1.6%)
TOTALS	145 (100%)	3622 (100%)

TABLE III

PATIENT PARITY

PARITY	STUDY POPULATION n = 147	CONTROL POPULATION "A" n = 3622
Nulliparous	61 (41%)	1666 (46%)
Parous	86 (59%)	1956 (54%)
TOTALS	147 (100%)	3622 (100%)

TABLE IV
CLASSICAL RISK FACTORS IN PAST MEDICAL / OBS. HISTORY (n = 147)

• Previous S.B., N.N.D., Rec. ABN	4
• Previous Babies B.W. ≥ 4 Kg	9
• Previous Babies with Cong. Anom.	2
• G.D.M. in earlier Preg.	6
• Family history of D.M.	31
Total	52 (35%)

achieve glucose stabilization. There were no instances of hyperglycaemic coma and hypoglycaemic attacks were transient, of mild nature, and managed effectively by the patients themselves.

Only two patients required brief hospitalization for stabilization. These were thought due to compliance problems compounded by language/cultural differences.

A total of 23 patients out of 145 GDM patients (15.8%) had labour induced: This is comparable to 10% in control population "A" and 17% in "B".

Of the 23 patients having induced labour, six were for "elective" reasons and were mostly in the early part of the study. The other 17 had indications as shown in table V.

TABLE V
REASONS FOR INDUCTION (n = 23)

Elective		6
Indicated		17
• Post Dates	6	
• Abnormal NST	2	
• ↑ B.S./ ↑ B.P.	5	
• Prom 38 wks x > 34 hrs	1	
• Bad Obs. Hx	1	
• Prev. Precip. Lab.	1	

TABLE VI
MODE OF DELIVERY (n = 139)

Spontaneous / Low forceps	76	(54.6%)
Mid-Forceps	25	(18.0%)
Primary C/S	20	(14.3%)
Repeat C/S	18	(13.0%)
Term Breech	0	

The mode of delivery of 139 GDM patietns is shown in table VI. In six patients it was unclear whether forceps delivery was low or mid. These patients were excluded from the analysis.

The mid forceps rate of 18% is similar to that in both control groups. It should be noted that a strict definition of mid forceps (Caput not distending the introitus) is used at the hospital. Also the incidence of epidural analgesia/anaesthesia use is 51% overall in both the study population and controls.

Table VII shows the caesarean section rates in the study and control population. Twelve of eighteen elective repeat caesarean sections were done at patients' request. The obstetrician's input contributing to the patient choices is an unmeasured quantity. There is no statistically

TABLE VII
CESAREAN SECTION RATE (%)

	GDM n = 145	CONTROLS "A" n = 3622	CONTROLS "B" n = 9435
PRIMARY	14.3	11.2	9.5
REPEAT ELECTIVE	10.8	5.9	
REPEAT	13.0	7.8	6.8
REPEAT FAILED VBAC	2.2	1.9	N/A
TOTALS	27.3%	19%	16.3%

significant difference in caesarean section rates between groups.

Table VIII lists the indications leading to the 20 primary caesarean sections done. Cephalopelvic disproportion leads the list with five (25%) as it does in all such lists. Significantly, five of the caesarean sections (25%) were done for complicated twin gestations. Another 3 (15%) were for complicated breech presentations while Premature Rupture of Membranes (PROM) contributed another 3 (15%). The other indications were PROM with high head (2), fetal distress in labour (2), PROM and cord prolapse (1), failed inductions (1), and traumatic previous vaginal delivery.

The distribution of birth weights is shown in Fig. I. When compared with the two control populations, these figures are practically identical. In fact, when macrosomia is considered the study group had a rate of 11.2% while control population "B" 11.3%.

Table IX lists the factors associated with the 23 deliveries prior to 37 weeks of gestational age. The total prematurity rate was 15.9%. If one subtracts three twin gestations and three conditions incompatible with life,

one obtains a corrected prematurity rate of 11.7%. This compares with 4% in control population "B".

Of the maternal complications, Pregnancy Induced Hypertension (PIH) was by far the most common - seen in seven or 4.8% of the GDM patients. This compares to a rate of 4% in control populations "B".

TABLE VIII

PRIMARY CESAREAN SECTION INDICATIONS (n = 20)

CPD, FAILURE TO PROGRESS, ETC.	5
PIH + PREMATURE TWINS	4
BREECH + OTHER COMPLIC. E.G. PIH	3
PROM + HIGH STATION	2
FETAL DISTRESS IN LABOUR	2
PROM + CORD PROLAPSE	1
PREVOUS BIG BABY (# CLAV.)	1
TWINS - "A" BREECH	1
FAILED INDUCTION	1

The identified fetal complications are shown in table X. There were two perinatal deaths out of 150 infants for a perinatal mortality rate of 13/1,000. Both babies had anomalies incompatible with life - one had Down's Syndrome with hypoplastic left heart, and the other non-immune hydrops from homologous alphathalassaemia associated with multiple anomalies. Both babies died within hours of delivery.

One fetus weighed 410g. at 21 weeks of gestation and was stillborn. The mother had cervical incompetence. This patient had GDM in a previous pregnancy and tested positive again in the index pregnancy. Her GDM was well controlled by diet alone and autopsy of the fetus revealed no major anomalies.

Missing from the list of causes of fetal morbidity are hypoglycaemia, hyperbilirubinaemia and polycythaemia. No precise figures are known but judging from length of stay in the nursery, these complications were not a significant contribution to overall morbidity.

DISCUSSION:

There are widely varying prevalence rates for GDM quoted from different parts of the world (10). Rates also vary within the same country depending on the popula-

TABLE IX

PREMATURE DELIVERY<37 Weeks (n = 23)

G.A. (WKS)	ASSOCIATED FACTORS			n
36	TWIN	1		
	PIH	3		8
	NONE	4		
35	PROM - BREECH	2		
	HOMOL. α - THAL	1		4
	NONE	1		
34	ABRUPTION	1		
	PIH	1		3
	NONE	1		
33	TWIN	1		
	PROM - BREECH	1		4
	PIH	1		
	↓ FM - ABNOR. NST	1		
32	TWIN	1		2
	PROM - CHORIO	1		
27	PROM	1		2
	DOWN SYN. (CHD)	1		
21	CERVICAL INCOM	1		1
PREMATURITY RATE		23/145	-	15.9%
CORRECTED PREM. RATE (TWINS & COND. INCOMP. WITH LIFE)		17/145	-	11.7%
CONTROLS "B"			-	4.0%

FIGURE 1 - BIRTH WEIGHT (G) G.D.M.

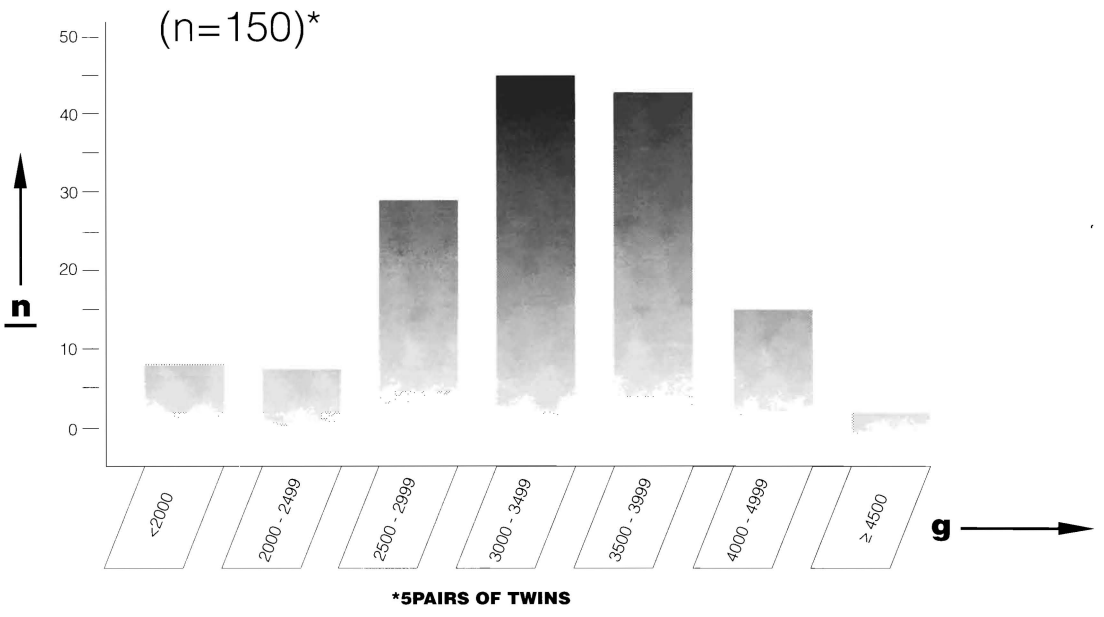

TABLE X: FETAL COMPLICATIONS (n = 8)

PERINATAL DEATHS		**2** (13/1000)
DOWN SYN. with CHD	1	
HOMOL α - THAL. with HYDROPS	1	
IMMATURITY (21 WKS - 410g B.W.)		**1**
MORBIDITY		5
LOW APGAR (<4 @ 1', <7 @ 5')	1	
CHORIOAMNIONITIS - I.U. INFECTION	1	
TRANSIENT TACHYPNOEA	1	
ABRUPTIO PLAC.	1	
PROLAPSE CORD	1	

tion tested. Thus Jacobson and Cousins (7) found an incidence of 4.3% GDM among over 2,000 patients in Loma Linda, California. Hispanics were more likely to have GDM than other ethnic groups in this study. The high incidence of GDM in the Pima Indian has been well documented (11).

In this study the overall rate of GDM was 3.9% which is close to Jacobson and Cousins' rate in the population-based study quoted above. It is also within the range of 1-5% quoted by Hadden (10). Our findings of a higher rate of GDM in the oriental population within our study group may have implications for the region. Since immigration from the Far East to North America has increased significantly in recent years, and since there appears to be an increased incidence of carboydrate intolerance in female offspring of GDM women (12), this higher incidence of GDM in orientals may have a long term impact.

In spite of ACOG recommendations to limit screening of pregnant women without risk factors for GDM to those over 30 years of age (2), there is no doubt that carboydrate intolerance can be picked up much earlier. In Coustan et al's study (13) 56% of the GDM patients were under 30 years old. They were using the low threshold value of 130mg/dL (7.2m mol/L) on their 50g. glucose screen. In the present study, using the higher threshold value of 8m mol/L, 40% of the GDM patients were below 30 years of age. This would suggest screening should not be limited by age.

The limiting of screening to patients with historical risk factors for GDM alone as suggested by Sullivan (14) has been frequently challenged. Our data suggests that screening only those with historical risk factors would result in a large number of undetected GDM patients.

Garner and Benzie (6) reviewed the data which supports universal screening rather than by risk factors alone.

Our choice of the 8m mol/L threshold (144mg./dL) for the 50g. glucose screen was somewhat arbitrary. So is the commonly used threshold of 7.2m mol/L (135 mg./dL) (15). The value we chose came closest to O'Sullivan's original threshold of 143 mg/dL which corresponds to 7.9m mol/L (14). Various thresholds have been used by

different investigators, which contributes significantly to the muddying of the waters in an area that can use more clarity and uniformity. Coustan et al (13), aiming for 100% sensitivity opted for 7.2m mol/L (130 mg./dL). Sacks et al (15) used a 7.5m mol/L (135 mg./dL) cut-off while Beard et al (16) used 7.8m mol/L (140mg./dL). Others such as Marquette and Skoll (17) suggest a 8.3m mol/L (150 mg./dL) threshold which would identify 88% of patients who would be picked up by a 7.2m mol/L (130 mg./dL) threshold but at 40% of the cost. Given the fact that a patient may test above or below the given threshold on two successive days (15) one may choose to opt for a lower rather than a higher threshold. On the other hand by putting the threshold at 8m mol/L we still get some 88% sensitivity with a specificity of over 80% (6) with considerable cost saving and fewer unnecessary tests. Even with our relatively high threshold, a full 19% (727 patients) of our study population had a positive 50g. screen and of these, 1 in 5 had an abnormal OGTT. Bringing the threshold down lower increases the number of patients having to undergo OGTT and probably picks up patients with extremely mild carbohydrate intolerance.

An area of even bigger confusion is that relating to the use of insulin in GDM. There have been suggestions that all GDM patients should be given insulin (18, 19) claiming reduced incidence of macrosomia and subsequent difficult delivery. These studies had methodological flaws. The only randomized trial comparing diet versus diet and insulin therapy showed no difference in maternal glucose control or neonatal outcome (20).

Accepting that insulin should be used only in cases where diet alone has failed to keep the GDM in good control is the first step. Established criteria on which to base intervention with insulin do not exist. Langer would start insulin when fasting "plasma" values are above 5.3m mol/L: Coustan, when the fasting "plasma" is over 5.3m mol/L or the 2-hour P.C. "plasma" level is 6.6/L or over: Gabbe uses a fasting "plasma" level of 5.8m mol/L or a 2-hour P.C. "capillary" level of 7.7m mol/L (21). In our study we chose to initiate insulin therapy when two consecutive reflectance meter (capillary) readings are 7m mol/L or higher or when readings in this range are more than just isolated. Using these criteria, we had 9.6% of our GDM patietns who required insulin. Jacobson and Cousins (7) had an incidence of 11.5% of GDM patients requiring insulin. Their criteria were different from ours requiring a fasting (capillary) glucose level of over 5.5m mol/L or a 2-hour p.c. level of greater than 7.2m mol/L.

The use of the reflectance meter for home self-monitoring of blood glucose levels has made a great difference in the management of diabetes mellitus in general. Landon et al (22) point out that the capillary blood following a finger stick is primarily arterial and has a higher glucose concentration that venous blood. Hanson et al (23) compared hospital care between 32 and 36 weeks and out-patient self-monitoring in a prospective, randomized study and found no significant difference in perinatal morbidity. Our experience with reflectance meters is that patients of different background and intelligence had no trouble using them. The patients felt they were significantly involved in their own management and this increased their motivation to do well.

Macrosomia in this study was defined as a baby wieghing 4,000 g. or more at birth. The designation LGA or large for gestational age (greater than the 90 percentile for gestational age) is a more accurate measure of intrauterine overgrowth. However, the term macrosomia has worked its way into the literature of GDM to the point where using it makes more sense for purposes of comparison. Boyd et al (24) found that the incidence of macrosmia in infants weighing over 2,500 g. at birth in the general obstetrical population has remained unchanged since the early 1960's. It is against such a backdrop that discussions about macrosomia in GDM have to be tested. Another pertinent point to make is that the majority of macrosomic infants are born to mothers with a normal OGTT (3).

That untreated maternal hyperglycaemia of prolonged duration will reslt in macrosomia in more patients than in controls is not questioned. The problem arises when one tries to correlate macrosomia with GDM. Some (25,26) have reported rates of macrosomia as high as 30% when mothers have GDM. In fact, Langer et al (27) and Lindsay et al (28) have reported a higher incidence of macrosomia in patients with just one abnormal value on OGTT and who, therefore, fall short of being technically gestational diabetics.

However, Boyd et al (24) concluded that wide application of an OGTT to pregnant women would be of limited value in identifying those with increased risk of fetal macrosomia. Also Pettitt et al (11) found glucose concentration, maternal weight and maternal age to be strongly related to each other and to macrosomia. After the confounding factors were removed by binary multiple regression analysis, third trimester glucose concentration was no longer significantly associated with macrosomia.

Furthermore, Thomson et al (29) warn that since the incidence of macrosomia is 10% in the normal pregnant population, one should be concerned about programs that could potentially reduce this level below "normal" as well as the effects of manipulating fetal growth in all women with GDM, the majority of whom have babies of normal weight. Langer et al (30) found that babies born to mothers with persistently low mean blood sugars, had a 20% incidence of IUGR. They found that mothers with glycaemic control ranging between 4.8 - 6m mol/L tend to have babies in the range comparable to the overall obstetrical population.

At the present study, macrosomia was found in 11.2% of the GDM pateints and 11.3% of the general obstetrical population ("B). We chose to interpret this as having achieved the desired effect of glycaemic control in our study population. The other interpretation, ie., that there

are as many as GDM patients in control group "B" as in the study population is less likely since the rate of macrosomia in both groups is very close to the 10% rate for "normal" obstetrical population sited by Boyd et al (24) and Thomson et al (29).

The induction rate of 15.8% in the study population is high compared to the 10% in control group "A" but similar to control group "B" which was 17%. Because of the style of group practice, the obstetricians within Pregna have elective induction of labour is quite uncommon. Within a subset of patients such as those that constitute a study group, there will be some who are rather anxious about their medical condition. Also the concept of allowing patients with GDM to go beyond the 40 weeks of gestation is relatively recent (21, 30) and early in the study, the obstetricians were anxious as well. When the GDM patients have excellent glycaemic control, and the fetus grows normally and has normal biophysical tests, we now feel confident that they are at normal risk for perinatal mortality. Coustan (21) and De Muylder (31) agree.

The maternal complication of note in the study was PIH: 4.8%. This rate is similar to that in the control group of Gerner et al (32). In that study, PIH was twice as common in GDM patients as in control - 9.9% vs. 4.3%. Lindsay et al (28) had results similar to Garner et al's with a doubling of PIH rates GDM. In fact they even found an increased risk of PIH in patients with only one OGTT abnormal value. Tallarigo et al (33) observed and increased risk of pre-eclampsia eclampsia in women with "limited degrees of hyperglycaemia". They conceded that this association was possibly the result of confounding and bias which their study could not identify or quantify. Since De Muylder (31) found PIH more frequently when GDM was diagnosed after the 32nd week of gestation, it is possible that the normal rate of PIH in this study population denotes early diagnosis and good glycaemic control.

As expressed earlier, this study had a very small component dealing with neonatal morbidity. No comments can be made pertaining to such possible complications as hypoglcaemia, hyperbilirubinaemia, and polycythaemia in the nursery. Hunter and Kierse (3) reviewed the literature and concluded that the case for increased risk of hypoglycaemia and neonatal jaundice is weak. In fact they claim that the risk of perinatal mortality and morbidity has been "considerably over-emphasized". On the topic of perinatal mortality, Coustan (21) says that as long as patients are identified and carefully managed, the risk should not be increased. De Muylder (31) uses the same logic and concludes that the rate and severity of the neonatal complications should be minimal.

CONCLUSION

One-hundred and forty-five patients diagnosed as GDM by the criteria of the Second International Workshop Conference on Gestational Diabetes (34) were managed according to a protocol of rigid glycaemic control. 9.6% required insulin to achieve this. The rate of macrosomia 11.2% was similar to controls. The caesarean section rate was not significantly different between groups. The maternal complication rates were minimal. The corrected perinatal mortality rate is 0.

Having gone through this exercise it is pertinent to ask oneself whether the results are good because of proper identification and management of the problem, or whether in fact, the problem was not there to start with.

Since considerable public money is being spent on universal screening for GDM, we need to know whether what we are doing is justified. Hunter and Kierse (3) suggest we should stop all forms of glucose tolerance testing in pregnancy except for research purposes.

Unfortunately, modifying established practice is difficult. As so aptly stated by Nadler (4) "The National Diabetes Data Group (1) criteria are so well established as the standard for diagnosis of GDM that it may be difficult ethically and legally to embark on the studies need to quantify risks and define treatment strategies across a full range of OGTT and fasting plasma glucose results".

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