

DETECTION AND MANAGEMENT OF GESTATIONAL DIABETES IN AN OUT-OF-HOSPITAL BIRTH CENTER

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ABSTRACT

The incidence of Gestational Diabetes Mellitus (GDM) reported in an out-of-hospital birth center serving 95% Hispanic women was 10%. A program to manage the care of GDM clients by certified nurse-midwives (CNM) and their physician consultants is described. The antepartum, intrapartum, and neonatal characteristics of 119 GDM clients between 1983 and 1985 is discussed. Intrapartum and newborn transfers to the hospital were similar when the GDM group was compared to the total population serviced by the birth center during 1984. There were no neonatal deaths in the GDM group. Macrosomia did occur in 26% of the babies of GDM mothers and shoulder dystocia was reported in 7.6%. The results suggest that a quality program can be established to care for GDM mothers in an out-of-hospital birth center. However, ways other than just good glucose control may be necessary to further decrease the incidence of fetal macrosomia.

This paper is a description of a program set up to screen, diagnose and manage diabetics within an out-of-hospital birth center in one of the poorest counties in the United States. Women who are diagnosed with Gestational Diabetes Mellitus (GDM) during their pregnancy are managed by Certified Nurse-Midwives (CNMs) in collaboration with consulting physicians at the Maternity Center of the Brownsville Community Health Center in Texas.

THE SETTING

The Maternity Center is an out-of-hospital facility staffed by CNMs who provide antepartum, intrapartum, postpartum, and newborn care at the birth center. The number of full time CNMs has fluctuated between

two and five plus an occasional part time CNM since the center opened in 1981. As there are no local CNMs, the center must recruit CNMs from other areas who come to Brownsville but usually do not plan to make it their permanent home. As the number of CNMs change, the center tries to keep the caseload of clients to between 12 to 15 per CNM a month. Approximately 550 to 600 women each year receive all or part of the maternity care at the birth center.

The Maternity Center is a part of the Brownsville Community Health Center that is funded by government grants to provide health care for low income families. Thirty-seven percent of families in this area are below federal poverty guidelines according to the 1980 census. The fees charged to families at the center are on a sliding scale depending on family size and income. The majority of families coming to the Maternity Center are very low income and pay

the lowest fee charged. Approximately 20% qualify for Medicaid or have private insurance. Many women come to the center because they prefer care by CNMs although others come for purely financial reasons. In 1983, 43% of births in this county occurred out of hospital. CNMs attended 20% of the births in birth centers and the other 23% were attended by lay midwives who provide little or no prenatal care. The Maternity Center is one of the few alternatives for low income women in the area that provide safe, affordable maternity care.

The Brownsville Community Health Center also employs one or two OB/GYN physicians and four to six pediatricians who serve as consultants to the CNMs in addition to their own caseloads. The CNMs have written protocols for management of women and babies under their care that have been approved by the backup physicians. The phy-

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sicians are readily available for consultation when problems arise in mother or baby. Comanagement or transfer to medical management occurs as indicated by the established protocols. If clients require transfer to the hospital, they are transferred to medical management since the CNMs do not have hospital privileges.

At the Maternity Center, 10% of the caseload of low risk pregnant women were diagnosed as gestational diabetics during 1984-1985. Couston and Carpenter report that glucose intolerance in pregnancy occurs in 1-5% of all pregnancies in the United States.¹ However, Hadden discusses the variation in incidence of GDM in different racial groups and geographic areas, such as the study of the Pima Indian tribe in Arizona that reports a much higher incidence of GDM than in other areas of the United States.² The population cared for at the Maternity Center is 95% Hispanic. Many of the women are of native American descent and are recent immigrants from Mexico. These factors may account for the high rate of GDM in our area.

The high incidence of GDM encountered at our out-of-hospital birth center had a large influence on our decision to develop a program to provide prenatal care, delivery services, newborn and postpartum care

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for gestational diabetics. The economic situation and the cultural practices of the women cared for at the center were two other influential factors. The majority of the clients at the Maternity Center are low income Hispanic women. Access to hospital care for many of them is very difficult due to their limited resources and the fact that there is no county hospital in the area to provide care to the indigent population. The second factor is the Mexican-American culture. Culturally, most of our clients and/or their families have always had their babies at home with lay midwives. People only go to the hospital if they are seriously ill. Many of our clients choose to come to the Maternity Center for their care because they enjoy the home-like atmosphere, and they prefer to receive their care from female health care providers. Since it would be difficult, if not impossible, to send all of our GDM clients to the hospital for their care, we decided to set up a special program for these women with the help of our OB/GYN physician backup and the clinic nutritionist. Prior to setting up our program in 1983, we reviewed the literature to use the most up-to-date information for screening and managing GDM mothers.³⁻⁸ After reviewing the literature, we felt confident that we could provide safe delivery services to GDM mothers who were managed and followed closely in our prenatal clinic and who had consistently controlled blood glucose values. We began to carefully compile data on our mothers and babies so that we could evaluate the outcome and decide if we were, in fact, providing them with safe quality care. All of our GDM clients were comanaged by Certified Nurse-Midwives and their OB/GYN physician backup team.

Gestational Diabetes Mellitus is a special problem that occurs during pregnancy. The term is restricted to pregnant women in whom the onset or recognition of glucose intolerance occurs during pregnancy.³ Studies

have shown that the risk of perinatal morbidity is significantly increased if gestational diabetes is not diagnosed, monitored, and controlled.^{1,9} Witness reports increased morbidity even in newborns of the GDM mothers who had good glucose control.¹⁰ It is therefore important for any prenatal care clinic to develop a specific protocol for screening, diagnosing, and follow up for gestational diabetics.

DESCRIPTION OF THE PROGRAM

White's definition of class A Gestational Diabetes Mellitus is used at the clinic.⁹ Clients were diagnosed with GDM if the onset had occurred during pregnancy. The test used for diagnosis is the 3 hour Glucose Tolerance Test (3°GTT) as proposed by O'Sullivan and Mahan.¹¹

Clients with one of the following risk criteria were screened for GDM at 28 weeks gestation. Clients with two or more risk factors were screened early in pregnancy and again at 28 weeks.

1. Family history of diabetes.
2. Previous history of GDM.
3. History of large babies for gestational age (LGA), (≥ 9 lb.).
4. Poor OB History.
5. Polyhydramnios.
6. Recurrent monilial vaginitis.
7. Large weight gain or poor weight gain.
8. Recurrent UTI.
9. Glycosuria, 1+ or more.
10. Over 35 years old.
11. Obesity.

The method of screening used was a 1-hour glucose test after drinking 50 g of glucola in a fasting state. A glucometer was used to test capillary blood (finger stick). Clients with glucose values of 135 or greater were rescheduled for a 3°GTT after 3 days of a high carbohydrate diet. The 3°GTT test, after drinking 100 mg of glucola, was also done by finger sticks using a glucometer. During this period of time, our clinic

laboratory was not able to do plasma glucose tests and the cost of sending them to an outside lab was not within our budget. The following numbers were used as the cutoff for normal values for the 3°GTT test using capillary blood (same values as for whole blood, mg/dl): FBS = 95, 1 hour = 165, 2 hour = 145, 3 hour = 125.³

A client was diagnosed with GDM if the fasting blood sugar (FBS) or two other values were met or exceeded. She immediately received an appointment with the clinic nutritionist to begin learning about the American Diabetic Association (ADA) diet. All of the women were placed on a 2000 caloric diet regardless of their weight. Teenagers were at times allowed approximately 200 more calories depending on their weight gain and activity level. The following week the client would begin classes with a CNM to discuss GDM so that the client would have a better understanding of the disease, the effects on the baby, and the importance of diet and exercise for glucose control. She would attend classes at least every 2 weeks to discuss a 24-hour dietary recall and the results of her FBS and 2-hour Postprandial (2°PP) glucose tests. During the classes, problems with dietary compliance or weight gain were identified. When necessary, another appointment was given with the nutritionist to discuss a client's diet.

The classes also became a support group for the women. They were able to talk to other women in the class with GDM who were also having to follow a "special diet." A diet low in carbohydrates is very difficult for a population used to eating sweet bread, tortillas, rice, tamales, pastas and that uses a large amount of oil and lard for cooking. Thus, our clients needed all the support they could get from the staff as well as the other GDM mothers.

The women attended classes at least every 2 weeks and, at times, every week if they were having diffi-

culty with their diet, weight gain or glucose control. Glucose control was followed with a 2°PP test, usually after lunch, every 2 weeks and a FBS once or twice a month, depending on the client's control.

The GDM clients would remain a part of the Maternity Center caseload as long as they were compliant with their diets, kept their appointments for classes and prenatal exams, and their blood glucose levels remained under control. Once the client started on her prescribed diet, her 2°PP values were expected to be less than 120 mg/dl and her FBS less than 95 mg/dl. These tests were done with a finger stick blood sample and a glucometer. If the client's glucose levels were consistently above these values (two abnormal FBS or more than two consecutive abnormal 2°PP), she was transferred to medical management for the rest of her pregnancy and delivered at the hospital. An occasional client seemed to become much more compliant with her diet after being transferred to medical management. With an immediate improvement in glucose control, she was then transferred back to the CNM caseload. All GDM clients who remained at the Maternity Center were comanaged with the OB/GYN who reviewed each chart as any problems arose.

Fetal surveillance starts at 36 to 37 weeks when the GDM clients begin to use a fetal movement chart. At 40 weeks, if she has not delivered, weekly Non Stress Tests (NST) are done. If at any time the NST is nonreactive, a Contraction Stress Test (CST) is done using nipple stimulation. If a client has a positive CST or a biophysical profile of less than 8, she is transferred to medical management. If a GDM goes to Post Dates (42 or more weeks), she is referred to the backup OB/GYN and admitted to the hospital for Pitocin induction.

In labor, a preadmission monitor strip is done on all GDM mothers if there is time (occasionally they are

admitted at 8 cm and deliver within a half hour). Women with abnormal monitor strips are referred to the physician. The women are allowed to drink juice in labor (diluted ½ juice and ½ water to decrease the amount of glucose intake). If an IV is necessary in labor, plain Lactated Ringers are used. If moderate to large ketones or prolonged labor occurs, the CNM consults with the physician and the client may be transferred to the hospital for the rest of her labor and delivery since her baby may be at more risk for hypoglycemia.

Because of the risk of hypoglycemia in the IDM baby, glucose levels are checked frequently. The routine is done on the cord blood, at 1°, 2°, 4°, 6°, and at discharge. They may be done more often if necessary depending on the newborn condition and the glucose results. The newborn and mother stay at the Maternity Center for 12–24 hours for observation. If the glucose results are 30–40, the baby is fed immediately with breast or formula and may be followed by 5% dextrose water (D₅W). If the glucose remains 30–40 one hour after feeding, the CNM consults with the pediatrician. If the glucose is less than 30, the pediatrician is consulted and D₁₀W is usually given orally to the baby. If the baby is unable to feed well and needs IV fluids, it is transferred to the hospital for care.

We were using Dextrostix (heel blood samples) and the glucometer to check glucose values in the newborns. However, we were getting many false low glucose values. Several low values were double-checked by using central venous samples and were found to be false lows. We therefore switched to using chemstrip bGs on heel blood samples in 1985 and have had fewer problems.

When mother and baby are discharged 12–24 hours after the birth, the mother is instructed in giving the baby frequent feedings every 2–3 hours and to report to the clinic if the

baby feeds poorly. The baby and mother are seen again at the clinic in 48–72 hours after discharge.

PROGRAM OUTCOMES

The following data were obtained on GDM clients who delivered between October 1983 and October 1985. There were a total of 129 women diagnosed as having GDM. Out of these 129 women, the majority (92.2%) remained well-controlled on their diet, received all of their prenatal care at the Maternity Center and intended to deliver at the center. Eight clients (6.2%) were transferred to medical management during the antepartum (AP) period. Six of these transfers were due to elevated blood glucose levels with all but one requiring insulin therapy; one transfer was due to hypertension; and one was due to an intrauterine fetal demise (IUFD) of unknown cause at 31 weeks. One woman decided on her own to transfer to a private physician and another moved out of the area. Data were collected on the 119 women who completed their prenatal care at the Maternity Center, including those who were transferred to the hospital for intrapartum (IP) complications.

Although Gestational Diabetes Mellitus occurred in all age groups, over half of them were 30 years or more (55.4%). Almost three-fourths (73%) were over 25 years old. GDM also occurred in primiparous as well as multiparous women. However, almost a third of the patients with GDM were gravida 6 or more. (See Tables 1 and 2)

Seventy-five of the women (63%)

TABLE 1
Age of women diagnosed with Gestational Diabetes Mellitus

Age	n	% (of 119 clients)
<20	8	6.7
20–25	24	20.2
26–29	21	17.6
≥30	66	55.4

TABLE 2
Gravida of women diagnosed with Gestational Diabetes Mellitus

Gravida	n	%
1	20	16.8
2	13	10.9
3	18	15.1
4	15	12.6
5	16	13.4
≥6	37	31.1

were diagnosed with GDM during their 28–32 week gestation. This is usually the time when most women were screened for diabetes. Some women were screened early for diabetes due to their risk factors. Nineteen women (16%) were diagnosed early, before 28 weeks. The other 25 GDM women (21%) were diagnosed late, after 32 weeks gestation. These women were screened late either due to developing risk factors or failing earlier appointments for their screening. Studies in the literature indicate that the optimum timing for screening for GDM for highest yield to be between 26–31 weeks gestation.^{12,14}

Most of the women with GDM (97 of the 119) already had one or more babies. Almost half (49%) of these women had at least one previous baby that weighed 9 lb or more. Of all the women diagnosed with GDM who had good glucose control (119), only 26% of them had babies who weighed 9 lb or more. The number of women with previous babies less than 6 lb (2.1%) and present babies less than 6 lb (2.5%) was approximately the same. In comparison, the total population of women who delivered at the Maternity Center in 1984, 8% had babies 9 lb or larger and 5% had babies less than 6 lb. (see Tables 3 and 4). We also kept data on the intrapartum and newborn complications that occurred in the GDM group. Most of this data is also available for our overall population in 1984 (see Tables 5, 6, and 7).

We compared the IP and Newborn (NB) transfers to the hospital with the statistics that were kept on

TABLE 3
Women with GDM who had a previous baby ≥9 lb or less than 6 lb

Previous pregnancy (T = 97)	n	%
9 lb or larger	48	49
<6 lb	2	2.1

all the Maternity Center clients who completed their care at the center in 1984. There appears to be no significant difference either in the total number of transfers, or in comparing each cause for transfer. There were no newborn deaths in either group at the Maternity Center and none after transfer to the hospital among the GDM group.

Since it is reported that newborn morbidity is higher among infants of diabetic mothers (IDM), we kept data on the NB problems of our GDM mothers. Unfortunately, this same data is not available for our Maternity Center caseload (see Table 8). Trauma occurred in 3.4% of the babies: one with a brachial palsy, one with a fractured clavicle, one with a fractured humerus, and one with a cephalohematoma. Hyperbilirubinemia of 12 or more in the first week of life occurred in 11.8%. Apgars at 1 minute of less than 5 occurred in 2 babies (1.7%) and at 5 minutes an Apgar less than 7 occurred in 1 baby (0.8%). Respiratory distress occurred in 4 babies (3.4%) in the first few hours of life. Three of these babies required transfer to the hospital for further observation. Data on hypoglycemia was only available on the babies born at the Maternity

TABLE 4
Comparison of the weight of baby of the present pregnancy of GDM women and the 1984 Maternity Center population

Weight of baby	n (GDM clients)	%	1984 pop %
9 lb or larger	31	26	8.0
<6 lb	3	2.5	5.0

TABLE 5
Intrapartum complications that required transfer to the hospital in GDM women and 1984 population

	GDM		1984 pop		(T = 508)
	n	%	n	%	
Prom >24 hours	2	1.7	11	2.2	
Breech	2	1.7	5	1.0	
Post date	3	2.5	3	0.6	
FTP/CPD	8	6.7	31	6.1	
Fever	1	0.8	10	2.0	
Fetal distress	1	0.8	05	1.0	
Hypertension	1	0.8	10	2.0	
Transverse/oblique lie	1	0.8	02	0.4	
Preterm del. (<37 wks)	2	1.7	11	2.2	
Prolapse cord	1	0.8	0	0	
Total	22	18.3	88	17.5	

TABLE 6
Other intrapartum characteristics of clients with GDM and the 1984 population

	GDM		1984 pop	
	n	%	n	%
Meconium	19	16.0	83	16.4
Shoulder dystocia	9	7.6	5	1.0
Vacuum/forceps	6	5.0	25	4.3
Cesarean section	11	9.2	38	7.5

Center and is difficult to report with accuracy due to the uncertain number of false low glucose values we may have obtained using the Dextrostix method. Only one baby (0.8%) was transferred to the hospital for hypoglycemia that would not resolve with oral feedings. The other 16% of the babies who had hypoglycemia (glucose less than 30 with or without symptoms) only needed frequent oral feedings to maintain normal glucose.

DISCUSSION

This paper is a description of the GDM program and its outcome in an urban community health center in one of the poorest counties in the United States. The program is an attempt to provide the low income Hispanic women of the area with an updated approach to managing Gestational Diabetes Mellitus to improve

their care and delivery outcomes. The program has to work within the government funded budget of the community health center. Although the number of CNM providers has fluctuated throughout the time of the program, there has been one consistent CNM in charge of the GDM program since it started in 1983, and all

TABLE 7
Newborn complications of clients with GDM and the 1984 population requiring transfer to the hospital

	GDM		1984 pop	
	n	%	n	%
Respiratory distress	3	3.1	14	3.4
Hypoglycemia	1	1.0	2	0.5
Hyperbilirubinemia	1	1.0	4	1.0
Meningitis at 1 week	1	1.0	0	0
R/O sepsis/fever	0	0	2	1.7
Meconium aspiration	0	0	2	0.5
NB deaths at M.C.	0	0	0	0
NB deaths after transfer	0	0	—	NA*

* NA = Not Available

of the CNMs on staff follow the established protocol of management of women with GDM.

The high percentage of Gestational Diabetics in our population (10%) is very significant. This may be due to the fact that the majority of the women are, to some degree, of native American descent. Also important is the age of the women with GDM. Over half of our clients were 30 years or older and two-thirds were over 25 years old. For clinics unable to screen all their clients (as now recommended), due to their budgetary constraints, they may be able to at least screen women over 25 years old.¹²

A high percentage of our multiparous clients (49%) had previous babies weighing 9 lb or more. Many of them had previously delivered all their babies with lay midwives at home and were never previously screened for GDM. With our program we were able to decrease that number of 9 lb or larger babies to 26%. In comparing this number with our total 1984 population (only 8.0% with 9 lb or larger), our findings concurred with the other studies that have shown that women with Gestational Diabetes may deliver large neonates even when their blood glucose seems to be under control.^{1,10}

Maternal complications among our clients do not appear to be significantly different from the overall caseload. There is only a slight dif-

TABLE 8
Neonatal morbidity of clients with GDM

	n	%
Congenital anomalies	1	0.8
Hyperbilirubinemia (12-18)	12	10.1
Hyperbilirubinemia (>18)	2	1.7
Apgars 1 min <5	2	1.7
5 min <7	1	0.8
Trauma	4	3.4
Resp. distress	4	3.4
Borderline SGA	1	0.8
*Hypoglycemia with symptoms (sxs.)	3	3.1
*Hypoglycemia without sxs. (<30 mg/dl)	13	13.4

* Data on babies born at Maternity Center only (T = 97).

ference in our cesarean section rate between the two groups. Even if we include our AP transfer clients who had cesarean sections, our percentage is 11%, which is still much lower than rates reported in a study by Philipson et al, who report a cesarean section rate of 18% in GDM mothers.⁹

The one complication that seems especially significant, due to its effect on the newborn, is shoulder dystocia. Of the 9 women (7.6%) who had shoulder dystocia, 7 were multiparous and 2 were primipara. The majority of the multiparous women (89%) who had shoulder dystocia had a smaller baby this time than previously, and had no known history of shoulder dystocia. Three of the newborns had trauma resulting from the shoulder dystocia.

Of all the babies with hypoglycemia only one required hospitalization for 1 day of observation. All the others responded well to frequent oral feedings. We had no perinatal mortality among our newborns as was reported in other studies.^{1,13}

We are proud of the program we have developed and feel that we are providing safe, professional care to our mothers and babies. Women who need medical management are referred to our physicians as indicated. We are constantly reviewing and updating our protocols for management. We will be looking at ways to decrease our number of shoulder dystocias and any resulting trauma.

Currently, sonographically derived estimates of fetal weight have not proven sufficiently sensitive in the hands of our backup physician team.

Due to the recommendations of the International Workshop-Conference on GDM in October 1984, we have made some recent changes in our screening protocol. As recommended, we now screen all of our women, since reports show that by only doing selective screening, 50% of GDM mothers may be missed.¹⁴⁻¹⁷ We are also now able to do our 3rd GTT and follow-up FBS with venous plasma samples. The rest of our program and classes for follow-up are the same. We continue to do our follow-up 2nd PP tests with finger sticks and the glucometer. We are beginning to look more closely at our GDM women with a history of more than one LGA baby who are showing early signs of an LGA baby this pregnancy. We may in the future consider transferring them antepartally to medical management to begin prophylactic insulin.¹⁸

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