

Gestational Diabetes in a Rural Setting

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Women who are already diabetic and become pregnant, as well as women who develop gestational diabetes, have increased risks of complications to both fetus and mother. These risks in gestational diabetes mellitus (GDM) can be reduced to near that of a non-diabetic mother by normalizing the blood sugar. The current recommended standards are reviewed. Utilizing a team approach, care was provided to patients with GDM in a rural primary care setting in order to attempt to normalize the blood sugar to the recommended level. Review of the outcomes of these pregnancies supports the conclusion that acceptable care for patients with GDM can be provided away from the tertiary care centers and in the primary care setting.

Understanding the pathophysiology of diabetes in pregnancy has influenced the therapeutic intervention, especially in regard to blood glucose control. This paper reviews current recommendations regarding the treatment of these patients and the application of these standards to our patient population. Our data support the contention that acceptable outcome of pregnancy in diabetes can be obtained in settings other than tertiary care health centers.

Maternal hormonal changes during the second and third trimester cause insulin resistance, glucose intolerance, and gestational diabetes in approximately 3% of all pregnancies¹. The later months of a normal pregnancy are associated with a lowering of the fasting blood sugar. The fetus, exposed transplacentally to elevated blood sugar levels, but lacking maternal insulin which does not cross the placenta, produces increased insulin which accounts for some of the changes in fetal development seen in gestational diabetes and pregnant diabetic patients^{2,3}. Even mild elevations in maternal sugar appear to have significant influence on fetal growth.

Fetal survival rates of less than 50% were recorded in pregnant patients with Type I diabetes in the 1930s before the introduction of insulin therapy^{3,4}. After the introduction of insulin therapy, improved care increased fetal survival to over 95% and markedly reduced complications of pregnancy.

The risk posed by diabetes to the outcome of pregnancy is further delineated in subsets based on the duration of the diabetes and secondary complications (retinopathy, nephropathy, neuropathy and cardiovascular disease) by the White Classification⁵. In the first trimester, women with diabetes have a significantly increased risk for spontaneous abortions^{6,7} and a 3-fold increase in the incidence of major congenital anomalies. These

women also experience a more rapid progression of secondary complications of diabetes.

There is a lower incidence of the later complications of pregnancy in GDM patients than in patients established with diabetes. Complications include a high incidence of in-utero death, prematurity, delayed lung maturation, macrosomia and associated birth trauma, neonatal hypoglycemia (30% to 50%), hypocalcemia (50%) and hyperbilirubemia¹. Preliminary, long-term outcome studies indicate the offspring of mothers with diabetes frequently have major problems with obesity during adolescence and a marked increase in the likelihood of developing diabetes.

Women with gestational diabetes have a 25% to 60% risk of eventually developing overt diabetes^{8,9,10,11}.

As reported by a number of investigators^{11,12}, prompt identification of gestational diabetes and appropriate intervention in order to normalize the blood sugar to that of the non-diabetic population reduces the maternal and fetal complication rate to near normal. In patients with known diabetes who are of childbearing age, prepregnancy counseling and diabetic control reduces the rate of spontaneous abortions and congenital abnormalities^{6,7,13}.

Screening for gestational diabetes should be done for all pregnant women between the 24th and 28th week; earlier screening should be done in the case of patients who have increased risk factors such as previous gestational diabetes, previous birth of a large baby, strong family history of diabetes, obesity and advanced maternal age^{1,12}. A definitive diagnosis is established by a 3-hour glucose tolerance test. The diagnosis is based on laboratory values; symptoms are rare unless marked glucose intolerance is present.

Maternal glucose control in both the gestational diabetic and the pregnant diabetic patient should parallel that of a normal pregnancy, with fasting glucose values maintained between 60 to 90 mg% and 2-hour post-prandial glucose below 120 mg%. Normal weight gain should be stressed. Most patients with GDM require strict dietary compliance, but those who fail to do so need prompt treatment with insulin. Oral hypoglycemic medication is not recommended in pregnancy because the fetal response to maternal hyperglycemia is to increase its own insulin production. Glycosylated hemoglobin levels reflect tight control, with levels above the mid-range of normal being unacceptable¹⁴.

Such standards are clearly met in research centers and large medical centers with selected populations. Many patients do not have access to these large, specialized centers. We have adopted these guidelines within our practice and had opportunity to do a retrospective review of our experience over an 18-month period. The successful outcome supports the value of continuing care in

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a primary care setting for these high-risk patients and provides guidelines for further improvement in medical care.

Methodology

The Waianae Coast Comprehensive Health Center (WCCHC) is a community health center serving a rural Oahu population of approximately 43,000 people. There were an estimated 400 deliveries a year managed through the WCCHC during the study period; however, not all patients received prenatal care. The physician group at the Center is multispecialty with primary care, specifically prenatal care, provided by family practitioners and/or nurse practitioners in conjunction with a Honolulu-based obstetrical group at a tertiary facility—the Kapiolani Medical Center for Women & Children (KMCWC).

All patients coming in for routine prenatal care are screened for diabetes at the 24th and 28th week of pregnancy by a venous glucose determination 1-hour after ingestion of a 50 gm glucose drink. High-risk patients (obesity, personal or family history of diabetes, a history of macrosomia, stillbirth, or congenital anomalies) are routinely screened earlier than 24 weeks. Those patients who test abnormal on screening for glucose intolerance undergo a standard 3-hour glucose tolerance test using a 100 gm oral glucose load to make a definitive diagnosis.

Patients with prior diabetes who have become pregnant and those who have gestational diabetes are referred to a general internist at the Center for medical management and to the Center's Nutrition Department for individualized diet counseling. Much of the education and coordination of care is provided by one office nurse who works with the internist.

In the current study, charts of all 17 patients with pregestational and gestational diabetes over an 18-month period (January 1989 to June 1990) were reviewed by an objective outsider. The analysis was limited to 12 patients who had complete records.

Results

Out of 17 patients, 16 had live births recorded. Four cases

were excluded because of inadequate information in the charts; 2 of these were excluded because of very limited information regarding delivery; one had only a single, late, third trimester prenatal visit prior to delivery, and the other changed providers due to a change in insurance plans. The following results are based on the 12 patients with GDM who had complete information in the chart (Table 1). All patients delivered at term with a mean gestational age of 39.25 weeks. None of the infants was heavier than 4500 gm but there were 5 who weighed between 4000 gm and 4500 gms. The average weight of the 12 infants was 3709 gm (8 lbs 3 oz). The average maternity weight gain during pregnancy was 27 lbs with a range from 9 lbs to 97 lbs. The pregravid weight was self-reported and not verified by an actual measurement. The mean weight of the mothers at delivery was 205 lbs.

Seven of the 12 deliveries were by C-section. Two of the C-sections were due to suspected macrosomia one of which was precipitated by evidence of fetal distress during early labor; the other was done electively. One C-section was due to suspected chorioamnionitis and the other 4 were repeat C-sections.

Ten women were multiparous, accounting for 28 previous pregnancies, 20 live births, 6 abortions and 2 cases of fetal demise. One of these was stillborn with congenital abnormalities and the other was one twin born very prematurely.

Four out of 12 women smoked cigarettes and 11 used alcohol at the time of the initial prenatal interview. Two patients continued to smoke up to the time of delivery. The average maternal age was 30 years with 8 of the 12 over 30 years of age.

Five patients required insulin to obtain desired blood glucose control, whereas the rest were controlled by diet. One patient was admitted to hospital for control of diabetes and subsequently developed premature contractions requiring a 28-day stay. Three other patients accounted for 4 pre-term admissions for premature contractions of 1 to 2 days each. One woman had severe idiopathic thrombocytopenic purpura in the first trimester requiring continued steroid treatment throughout the rest of the pregnancy; this undoubtedly weakened her glucose intolerance.

None of the patients had significant postpartum problems requiring extended hospitalization. All 12 offspring left the hospital with their mothers. Mild hypoglycemia corrected by appropriate feeding was noted in 2 infants. There was a transient mild drop in the platelet count in the infant of the patient with ITP. There were no other problems noted in the hospital course of the infants. All 12 had 5 minute apgar scores of 9.

Discussion

Our study, while very limited in scope, does demonstrate the safety of predominantly community-based care for these high-risk patients. The results indicate that patients with GDM followed at the WCCHC carry to term and deliver healthy babies. Five infants were over 4000 gm and would be considered macrosomic. Four of the macrosomic infants were delivered by C-section, 2 because of a previous C-section and 2 due to suspected macrosomia. There were no infants heavier than 4500 gm, which is considered by some to indicate macrosomia².

Of the 22 preceding pregnancies in the study population which carried beyond 30 weeks, 2 (9%) ended in stillbirth. This population, as a group, had multiple risk factors in addition to diabetes. Obesity was present in a majority of the patients with an average delivery weight of 205 lbs. Eight out of 12 were over 30 years old, which is considerably older than our average obstetric

Table 1: Patients with Gestational Diabetes

	Age	Reported Pregravid Weight (lbs)	Delivery Weight (lbs)	Gestational Age (in Weeks)	Birth Weight (in Grams)
1	33	185	219	40	3881
2	37	259	286	40	4275
3	34	190	201	40	4022
4	24	129	161	38	4163
5	30	156	156	37	2600
6	28	246	272	40	4303
7	31	250	261	40	3347
8	32	110	154	40	3572
9	35	148	143	38	3966
10	22	180	203	37	2788
11	22	151	248	40	4359
12	32	150	161	41	3234
Mean Average	30	180	205	39.25	3709

patient. Nine of the 16 patients were Hawaiian or part Hawaiian, reflective of the ethnicity of the Waianae Coast population. Smoking and the use of alcohol were inherent habits in several of the patients at the time of the initial prenatal visit. Counseling about smoking in terms of the increased risk to the pregnancy resulted in compliance with the health-education message in 3 out of 4. One patient had ITP with a fall in the platelet count to 1000 shortly after presenting with petechiae in her first trimester, as aforementioned.

The earlier practice of delivering diabetic patients prior to term in order to avoid fetal demise has been replaced over the past decade by close monitoring of these women in the third trimester¹⁵. C-section is required at the first sign of any fetal distress. The 58% (7 of 12) C-section rate in our study population is clearly much higher than that for a normal population. However, further analysis shows that 4 were repeat C-sections and one was an emergency section.

Effective care of patients with diabetes and pregnancy takes time and teamwork. In our rural setting, a limited number of providers are involved in the patient's care. No written protocol or formal program is developed specifically for these women. A coordinated effort and a common understanding of the standards of care, as well as individual care plans was achieved by the Health Center team. The cornerstone of the care plan is timely nutritional intervention and the availability of providers for teaching and medication adjustment. Patients requiring insulin are seen by the nurse daily until home glucose monitoring and insulin administration are learned. Daily or twice daily phone contact with the internists allows for rapid control of the diabetes without hospitalization. Insulin needs are dynamic during the pregnancy, often requiring frequent adjustments, which is usually accomplished by phone. Pre-term monitoring of the pregnancy is done through outpatient service at the KMCWC.

Even though patient care at the WCCHC is entirely managed by primary care providers, significant support through informal education and direction is being provided by specialists at KMCWC and an endocrinologist interested in gestational diabetes. The support of these specialists has been valuable in the care of these patients.

As in any practice setting, the chart review process reveals problems with certain patients where management could have been improved. Dietary compliance is a concern in the case of many patients. Frequent physician contact is required for insulin adjustment. Accurate and complete charting is mandatory. Inter-departmental communication problems need to be resolved.

A number of patients from the Waianae area receive little or no prenatal care and are missed in the screening for gestational diabetes as a consequence.

Finally, there is considerable interest being focused on the incidence of gestational diabetes in the Waianae population and in other predominantly Hawaiian populations. The incidence can be accurately calculated only if one knows for certain that all patients are screened; this was not possible in the present study. It is our impression that the incidence of gestational diabetes is not much higher than the approximately 3% national average.

Conclusion

Our results support the conclusion that pregnant patients with GDM can be managed in a primary care setting. To provide the best chance for a healthy infant to be delivered, very tight control must be maintained throughout the pregnancy. The care of diabe-

tes, both pregestational and gestational, requires considerable time and effort to provide effective patient education, to monitor, to adjust treatment throughout the pregnancy and to obtain good patient compliance.

The study has relevance in the whole State of Hawaii where tertiary obstetric care is centered only in Honolulu, distant from rural Oahu and from the Neighbor Islands. The tertiary-care specialist is an essential member of the health care team in providing informal consultations and education for the primary care providers as well as the management of the occasional patient who will have complex obstetric problems.

Care of the mother and infant does not stop with a normal or successful delivery. Because of the increased risk for development of overt diabetes, women with gestational diabetes who are overweight should receive counseling in weight control. Both mother and offspring should be screened for diabetes when there are any suggestive symptoms.

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