Frequent Monitoring of A1C During Pregnancy as a Treatment Tool to Guide Therapy

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Objective: No guidelines for A1C measurement exist for women with gestational diabetes mellitus (GDM). The aim of this study was to document the rate of A1C decline in women with GDM.

Research Design and Methods: Women with GDM in the Santa Barbara County Endocrine Clinic are managed with a carbohydrate restricted diet and self-monitored blood glucose before and 1-hour postprandial. Insulin is started if the pre-prandial is \( \geq 90 \text{ mg/dl} \) and/or a 1-hour postprandial is \( \geq 120 \text{ mg/dl} \). Capillary A1C was tested weekly using the DCA2000® + analyzer.

Results: 24 women with GDM (age 29.0 ± 7.3 years) with initial A1C \( \geq 7.0\% \) were recruited. Baseline A1C was 8.8 ± 1.8%. Mean A1C decline was 0.47 % per week (range 0.10-1.15%); the maximum was 4.3 % in 4 weeks.

Conclusions: This study documents rapid decline in A1C during pregnancy and the utility of weekly A1C to guide therapy.

Glycosylated hemoglobin (A1C) is routinely measured about every three months in people with diabetes to assess the mean glucose concentration. The red blood cell life span is approximately 120 days (1). Thus the three month interval between testing A1C reflects the mean blood glucose over the preceding weeks to months. There are no clear guidelines for the frequency of testing A1C during pregnancy (2). In pregnancies complicated by type 1 or type 2 diabetes, most studies report the relationship between the first trimester A1C and the risk of spontaneous abortion and/or congenital malformations (3,4). The goal for therapy in pregestational diabetes is to sustain the A1C less than 6.0% although this level of A1C assumes that the measurement is performed only once each trimester (5-9). In addition, A1C is not recommended routinely in women with gestational diabetes mellitus (GDM)². The life span of the red blood cell during pregnancy is shortened to approximately 90 days and thus the test measures the mean glucose over a shorter time interval than in the non-pregnant state (10). Hence the rate of change of A1C in pregnancy reflects the glycemic control over the past few weeks. Therefore the measurement of A1C more frequently during pregnancy may be used to guide therapeutic decisions in all pregnancies complicated by diabetes including GDM. The aim of this study was to document the rate of A1C decline during the first four weeks following the initiation of treatment in women with gestational diabetes mellitus.

METHODS
This was an observational study of pregnant women attending the Santa Barbara County Health Care Services Obstetrics Clinic for care who have the diagnosis of gestational diabetes mellitus (diabetes first diagnosed during pregnancy (2)) and who were referred to the Prenatal Diabetes/Endocrine Clinic for management. Because of the high rates of diabetes in this largely Latino population and because many of the women only seek medical attention during pregnancy, women are screened for GDM very early in pregnancy. Many women found to have diabetes early in pregnancy undoubtedly have pre-existing type 2 diabetes, which falls under
the classification of GDM when first identified during pregnancy. Treatment consists of a carbohydrate restricted meal plan (11) and fingerstick blood glucose monitoring before and 1-hour after each meal (11). Insulin is initiated if the diet does not achieve pre-meal glucose concentrations < 90 mg/dl and/or 1-hour postprandial glucose concentrations < 120 mg/dl within one week of the carbohydrate restriction prescription (12,13). For simplicity in the clinic, and to impress upon the diabetic women the importance of tight glucose control, a point of care A1C by fingerstick is routinely measured at every weekly visit and analyzed immediately using the DCA2000® analyzer (14, 15). The DCA A1C is a CLIA-waved test with a coefficient of variation of 2.3-3.3% at a normal A1C concentration of 5.2% and of 2.8-3.7% at an elevated A1C concentration of 11.9%.

RESULTS
Twenty-four Latina women diagnosed with GDM whose initial A1C was ≥ 7.0% and followed during the first one to four weeks of treatment were including in the analysis. The mean (±S.D.) age was 29.0 ±7.3 years, A1C at enrolment was 8.80±1.83 and the duration of follow up for this study was 3.2±1.0 weeks. Mean gestational age at diagnosis of GDM was 12.2±7.4 weeks.

Figure 1 shows the A1C decline during the first 4 weeks of treatment (range 1.0 to 4.0 weeks) for all 24 women. The mean decline was 0.47±0.30% per week and the maximum decline over the four weeks was 4.3%. The decline was greatest among women with the highest A1C at baseline. Among the 20 women with an initial A1C < 10.0%, the decline was 0.36±0.15% per week. After the first month of decline, the A1C stabilized with a small drop of only 0.05% per week to the end of gestation (data not shown).

SUMMARY
This study documents that a rapid decline in A1C can be achieved during pregnancy when normoglycemia is vigorously instituted and achieved and thereafter sustained for four weeks. Home glucose monitoring on a regular basis is certainly the cornerstone of management of GDM and was initiated in the women enrolled in this study from the beginning. However, many high glucose values can be missed with the usual six or seven fingersticks per day. When A1C is measured at every weekly visit and the result compared to the woman’s previous value, then the rate of change of A1C (decline or rise) can be used to assess the glycemic control and guide therapeutic decisions. A randomized trial in a larger group of women will be needed to determine if weekly A1C measurements will lead to an improvement in outcome.

Author contributions. All authors (LJ, HS, MM, AT and DJP) participated in the study design, data collection, data analysis and writing of the manuscript.

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REFERENCES


FIGURE LEGEND
Figure 1. A1C (%) at enrollment and weekly for up to 4 weeks of follow-up in 24 women with gestational diabetes mellitus