Research Article

Is Previous Pregnancy Affected By Diabetes Mellitus Protective against Poor Glycemic Control at the Start of Subsequent Pregnancies?

Mulla BM* and Zelig CM
Department of Obstetrics and Gynecology, Naval Medical Center Portsmouth, USA

Abstract

Aims/hypothesis: Poor glycemic control at conception, a strong risk factor for birth defects, is frequently attributed to low rates of pre-conceptual counseling. The objective of this study was to determine if counseling during a first pregnancy with diabetes improved glycemic control at conception in subsequent pregnancies.

Methods: Case controlled. 71 diabetic women previously followed during pregnancy at a single tertiary center were divided into two groups, those with diabetes at the start of a previous pregnancy, and those without. The two groups were compared for glycemic control at conception; hemoglobin A1C ≥ 7 was considered poor control. The two groups were also compared for very poor control (hemoglobin A1C ≥ 9), pre-conceptual counseling, and pre-conceptual folic acid use.

Results: Poor glycemic control at conception was as prevalent in the 29 previous diabetic patients as in the 42 first-time diabetic patients (51.7% vs. 57.1%, p=0.7). There was no difference in the proportion of diabetic patients with very poor control (17.2% vs. 23.8%, p=0.5), pre-conceptual counseling (6.9% vs. 4.8%, p=1.0) and folic acid use (32.1% vs. 31.0%, p=0.9).

Conclusions/interpretation: Previous pregnancy affected by diabetes did not improve glycemic control in a subsequent pregnancy. Expanding the counseling these patients receive in our institution should be considered.

Keywords: Pregnancy; Diabetes; Hemoglobin A1C

Introduction

There is an increased rate of serious birth defects in the offspring of diabetic women. These birth defects include anomalies of the fetal central nervous, cardiac, skeletal and renal systems. Evidence for this effect is a well established relationship between the maternal serum HbA1c level in early pregnancy, the main period of organogenesis; and congenital anomalies in the offspring of that pregnancy. Cutoff values for early HbA1C and risk of major congenital malformations are: HbA1c < 7, 2-3%; HbA1c of 7-8.9, 5-10%; 9-10.9, 10-20%; ≥ 11, >20% [1-4]. Many pregnancies in the United States are unplanned and therefore lack preconceptual planning. In diabetic women, such planning focuses on good glycemic control before conception with a targeted HbA1c of less than 7 in order to minimize the risk of birth defects. In a prospective cohort trial, preconceptual counseling of diabetic patients was associated with an improvement in the proportion of patients with optimal glycemic control from 40% in the group with no preconceptual counseling to 81% in those with preconceptual counseling [5]. For many diabetic women, their first regular exposure to an obstetrician does not occur until their first pregnancy is well underway. Since it is a routine part of obstetrical care to counsel diabetic patients about the importance of good glycemic control, it is possible that maternal HbA1c levels at the start of subsequent pregnancies would be lower than in the first pregnancy affected by diabetes. That is, education of diabetic patients by their obstetrician during a first affected pregnancy should theoretically result in better pre-conceptual planning and better glycemic control at the start of subsequent pregnancies. A study by Rosenn et al. noted significantly improved glycohemoglobin concentrations at 9 and 14 weeks gestation in insulin-dependent diabetic patients who received counseling for two consecutive pregnancies compared with those who entered a counseling program for the first time [6]. Another study looked at the protective effect of previous pregnancy on glycemic control during the entire gestational period of subsequent gestations, but was underpowered to measure changes in HbA1c levels in early gestation [7]. A third study looked at the glycemic control in early pregnancy of African American patients with type 1 diabetes, of which a significant difference of HbA1c based on parity was present, but this was not the primary objective of the study [8].

If glycemic control is not improved in subsequent pregnancies, prenatal education by obstetricians may need to be changed to better prepare their patients for future conceptions. Additionally, counseling between pregnancies by the patient’s other healthcare providers may need to be adjusted.

Methods

We conducted a retrospective case-control study of diabetic women who received prenatal care at our center from 2003 to 2010. The study was approved by the Institutional Review Board of Naval Medical Center Portsmouth. Data were derived from our electronic medical record system and from our delivery logs. Patients were identified by the diagnosis of diabetes mellitus at the start of the subject gestation, from ICD-9 or equivalent diagnosis codes.

There were a total of 120 patients in the database; 71 met inclusion criteria for our study. Patients were excluded if they did not have a hemoglobin A1C during the peri-conceptual period, i.e. between 3-6 months prior to conception. Poor glycemic control was defined as HbA1c ≥ 7 in the 29 previous diabetic patients as in the 42 first-time diabetic patients (51.7% vs. 57.1%, p=0.7). There was no difference in the proportion of diabetic patients with very poor control (17.2% vs. 23.8%, p=0.5), pre-conceptual counseling (6.9% vs. 4.8%, p=1.0) and folic acid use (32.1% vs. 31.0%, p=0.9).

Conclusions/interpretation: Previous pregnancy affected by diabetes did not improve glycemic control in a subsequent pregnancy. Expanding the counseling these patients receive in our institution should be considered.

Keywords: Pregnancy; Diabetes; Hemoglobin A1C

*Corresponding author: Mulla BM, 620 John Paul Jones Circle, Portsmouth, VA, USA, Tel: 757-953-4351; Fax: 757-953-0892; E-mail: bethany.mulla@med.navy.mil

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months preconception and 14 weeks post-conception, and if they did not receive prenatal care at our facility. If a patient had more than one affected pregnancy, she was counted for the most recent pregnancy only. Patients who received prenatal care but did not deliver at our facility were still counted as part of the study.

For each subject, the following data was extracted: maternal age, race and parity, singleton or twin gestation, pre-pregnancy height, weight, BMI, age at diagnosis of diabetes, duration of diabetes, method of control, co-morbid medical conditions, number of previous pregnancies complicated by diabetes, HbA1c level between 3 months preconception and 14 weeks post-conception, presence or absence of folic acid use starting more than one month prior to conception, presence or absence of nutrition consult prior to pregnancy, mode of delivery, and birth weight. If the patient had more than one HbA1c level drawn meeting our study criteria, the one drawn closest to the time of conception was used. The patients were also classified based on presence or absence of insulin therapy prior to pregnancy. Patients who received prenatal care but did not deliver at our facility were still counted as part of the study however infant birth weight and mode of delivery were not recorded for those patients.

The patients were divided into two groups for comparison. The first group consisted of patients being followed for their first pregnancy with pre-existing diabetes; the second group was comprised of patients with type 1 or type 2 diabetes during a previous pregnancy. The primary outcome measure was the presence or absence of poor glycemic control during the peri-conceptual period. Well-controlled diabetic patients were defined as having a hemoglobin A1c less than 7 and poorly controlled diabetic patients were defined as a hemoglobin A1c greater than or equal to 7. Very poor glycemic control was defined as having a hemoglobin A1c greater than or equal to 9. Secondary outcome measures were very poor peri-conceptual glycemic control, use of preconceptual counseling, use of pre-conceptual folic acid for at least one month before conception, mode of delivery, and birth weight. We hypothesized that patient education during a previous pregnancy better prepares diabetic patients for subsequent pregnancies as demonstrated by better glycemic control at conception of the subsequent pregnancies.

Statistics were carried out using the OpenEpi.com web site from the Center for Disease Control and Prevention (CDC). Categorical variables were compared using a two sided Chi-squared statistic and continuous variables were compared using a two-sided Student t test. Based on a previous study [5], we powered our study to detect an increase in the proportion of patients with good glycemic control from 48% to 81% using a beta of 0.2 and an alpha of 0.05, a minimum of 27 subjects was needed in each arm [9].

Results

For the 71 subjects studied, poor glycemic control at conception was as prevalent in the 29 previous diabetic patients as in the 42 first time diabetic patients (51.7% vs. 57.1%, p=0.7). Also, there were no differences in the proportion of patients with very poor glycemic control (17.2% vs. 23.8%, p=0.5), pre-conceptual counseling (3.4% vs.14.3%, p=0.16) and pre-conceptual folic acid use (31.0% vs 31.0%, p=0.99) (Table 1).

In patients not requiring insulin prior to pregnancy, there was a non-significant trend towards better glycemic control, i.e. fewer patients with poor glycemic control, in the previous diabetic pregnancy group compared to the first time diabetic pregnancy group (18% vs. 48%, p=0.1). Previous diabetic pregnancy was not protective against poor glycemic control at conception in diabetic women taking insulin prior to pregnancy (72% vs. 71%, p=1.0). In addition, previous diabetic pregnancy was not protective against very poor glycemic control (hemoglobin A1c ≥ 9) in either subgroup. These results are summarized in (Table 2).

Patients who required insulin prior to pregnancy were more likely than those not requiring insulin to have poor control (71% vs. 39%, p<0.01) but not very poor control (23% vs. 19%, p=0.7). These results are summarized in (Table 3). There was a significantly higher proportion of patients with pre-pregnancy insulin use within the group with...
Discussion

In our study, glycemic control at conception was no better in experienced diabetic patients, those with a history of diabetes pre-dating one or more prior gestations; than in novices, those with their first diabetic pregnancy. Poor glycemic control in the novice group is not surprising given the low rate of pre-conceptual counseling we and others have observed. The equally poor glycemic control at conception in the experienced diabetic patients was unexpected since all of these patients should have received counseling from their obstetrician during and after previously affected pregnancies. A potential effect modifier in this study was the patients requiring insulin prior to pregnancy, who comprised nearly half of our subjects. In this group, there was a high prevalence of poor glycemic control at conception in novice and experienced patients, 71% and 72% respectively. This may reflect the generally more severe underlying disease in type 1 diabetic patients and type 2 diabetic patients requiring insulin when not pregnant compared to non-insulin dependent type 2 diabetic patients of childbearing age. By comparison, we observed a trend towards improved glycemic control in the experienced patients requiring insulin prior to pregnancy compared to the novice patients not requiring insulin prior to pregnancy. It is possible that this result would have been more significant if our study population had been predominantly type 2 diabetic patients.

We recognize that increased birth defects can occur at HbA1c values below 7, and that there is no true threshold value below which the risk of congenital anomalies is eliminated. However, the increase in birth defects is minimal with HbA1c values below 7 in most studies [10,11]. Clinical guidelines that existed during the study period used <7 as a target HbA1c for women attempting conception [12,13]. The decision to use HbA1c values from 3 months before pregnancy until 14 weeks post-conception reflects the traditional study period for teratogenic effects. The findings in our study highlight the need for pre-conceptual planning in fertile diabetic women. A multidisciplinary team approach consisting of the patient's primary care physician, endocrinologist, obstetrician and any other healthcare providers should be considered. In addition, different strategies may be needed for patients requiring insulin prior to pregnancy, since, on average; these patients tend to have worse glycemic control and may represent a sicker, more difficult group to treat.

Contribution Statement

B.M. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

B.M. researched data and wrote the manuscript. C.Z. contributed to the discussion and reviewed/edited the manuscript.

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References


