California Diabetes and Pregnancy Program (CDAPP) Data Report

2001 – 2002 Data

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Introduction

The mission of the California Diabetes and Pregnancy Program (CDAPP) is health education, promotion and prevention directed towards improving outcomes for women who have pre-existing or gestational diabetes.

Our goals include the following:

- To improve care for women with diabetes, or who develop diabetes during pregnancy so that pregnancy outcomes match those of non diabetic women with respect to:
  - Intrauterine growth patterns
  - Birth defects
  - Mortality and morbidity

- To promote prevention of prediabetes and diabetes for all women developing gestational diabetes and for all offspring of women with diabetes in pregnancy.

We accomplish these goals by:

- Establishing, consulting with, and mentoring to Sweet Success Clinical Affiliates who promote optimal management of diabetes in all women, before, during and after pregnancy.

- Encouraging the utilization of interdisciplinary Sweet Success health care teams to provide educational, research based, culturally appropriate, prevention and health promotional strategies as outlined by the Sweet Success Guidelines for Care.

- Utilizing outcome data collected from all affiliate sites to educate professionals on the effectiveness of this evidence-based care.

These goals are consistent with the purposes of the Title V Maternal Child Health Branch Program.

This report on Sweet Success services is intended for healthcare providers and patients. The purpose is to provide a demographic profile of Sweet Success patients and their birth outcomes and to enhance education about diabetes during pregnancy.

This report is based on data that were collected between January 2001 and December 2002 at 127 Sweet Success affiliate sites throughout California. From a total of 11,952 data forms submitted, data on 11,740 maternal clients were eligible for analysis in addition to data on 11,844 newborns born after 20 weeks, including 202 set of twins, and 5 sets of triplets (there were 108 spontaneous abortions dropped from analysis). The findings presented in this report may not generalize to the entire population of Sweet Success patients.

For more information, please contact the CDAPP Data System Coordinator at 858-467-4990.
Maternal Age at Delivery

- Most women (59%) were in the age group of 30 - 39 years (See Figure 1)
- Eleven percent were 40 years or older, and one percent were in their teens.
- These two age groups (older women and teens) might be considered at-risk for birth outcomes of pregnancies that are complicated by diabetes.

![Figure 1. Maternal Age at Delivery](image-url)
Race & Ethnicity

- Differences in screening practices and in other risk factors make it difficult to quantify the independent contribution of race and ethnicity to developing Gestational Diabetes Mellitus (GDM).

- The following ethnic groups have a high rate of GDM: Hispanic, Native American, Asian, African-American. The percentages below may not be representative of the absolute risk of the population at large.

- Approximately half of all patients (52%) seen in Sweet Success were of Hispanic origin. Other major groups represented were White/Caucasian (23%) and Asian (20%) (see Figure 2).

![Figure 2. Maternal Race/Ethnicity](image)

- Categories:
  - Black/African American
  - Hispanic/Latina
  - Asian (including Far and South East Asian, Asian Indian, Pacific Islander)
  - Native American/American Indian
  - White/Caucasian
  - Multi-racial/ethnic (patients who reported more than one racial or ethnic background)
Pre-pregnant Body Mass Index

- Body Mass Index (BMI) is a calculation using height and weight, which provide an estimate of how much body weight is from fat. BMI accounts for the differences in body composition by defining the level of fatness according to the relationship of weight to height, thus eliminating dependence on body frame size.

- Obesity is a national epidemic. Obesity and diabetes are continually increasing, with a 5.6% increase in obesity (in BMI greater than or equal to 30), and an 8.2% increase in diabetes from 2000-2001. (1)

- Obesity and diabetes are strongly related. With a BMI greater than or equal to 30, there is a three fold increase in diabetes; and with a BMI greater than or equal to 40, there is a seven fold increase in diabetes. (1)

- The Nurses' Health Study presented a link between obesity and type 2 diabetes. At a BMI of about 25, the age-adjusted relative risk of diabetes increases. (2)

- Maternal obesity is also a strong predictor of babies that are large for gestational age (LGA) or big babies. (3)

- Approximately 42% of the Sweet Success patients seen in 2001-2002 were obese prior to pregnancy (with a BMI higher than 29)* (see Figure 3).

* Use caution in interpretation since pre-pregnant weight is usually self-reported
**Underweight and obese categories are based on the Institute of Medicine recommendations (4)
***CDAPP has adopted the lower cut-off points for overweight BMI from the IOH (National) Guidelines (5)
Diabetes Diagnosis at First Sweet Success Visit

- Most patients seen in Sweet Success have Gestational Diabetes Mellitus (GDM) at the first Sweet Success visit. GDM is usually diagnosed at 24-28 weeks gestation (6.5 months).

- GDM is usually diagnosed by a 50 gram glucose drink with a 1 hour blood sugar result of 140 or more followed by a 3 hour oral glucose tolerance test (OGTT) with 2 abnormally high results. (6)

- When only one result is abnormal, we refer to this as IGT – Impaired Glucose Tolerance. Because there is evidence that with only one abnormal value on the OGTT the outcomes are similar to GDM, we recommend counseling for healthy eating, exercise, and follow-up for IGT patients. (7)

- GDM is most common in women who:
  - Have a close relative with diabetes
  - Are obese
  - Are from one of the following ethnic groups:
    - American Indian
    - Black
    - Hispanic
    - Asian
    - Pacific Islander
    - East Indian
  - Had a > 9 lb baby in the past
  - Had a baby that died before birth in the past
  - Have Polycystic Ovarian Syndrome

- GDM means that carbohydrates (foods that turn to sugar in the body) are not being processed normally by the mother resulting in too much sugar in her body going directly to the baby.

- Women diagnosed with GDM have an increased risk of developing prediabetes and type 2 diabetes after pregnancy.

- GDM is most often treated by healthy eating and exercise and less often by adding insulin.

- As seen in Figure 4, 88% of the patients seen in Sweet Success were diagnosed with GDM.

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**Figure 4. DM Diagnosis @ First SS Visit**

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGT</td>
<td>2%</td>
</tr>
<tr>
<td>GDM</td>
<td>88%</td>
</tr>
<tr>
<td>Type 1</td>
<td>7%</td>
</tr>
<tr>
<td>Type 2</td>
<td>2%</td>
</tr>
<tr>
<td>Unknown</td>
<td>1%</td>
</tr>
</tbody>
</table>
Gestational Age at GDM Diagnosis

- The point in pregnancy at which a mother is diagnosed with GDM can be very important.

- Most women are diagnosed between 24-28 weeks gestation (around 6 months) because this is the time when the hormones of pregnancy begin to have the strongest effect on sugar metabolism. We expect most women to develop GDM at this time.

- If women develop GDM earlier it may be a sign that they already have problems with the sugar metabolism. These problems may increase their need for insulin therapy and monitoring postpartum for the presence of pre-diabetes or type 2 diabetes.

- The point in pregnancy at which we diagnose diabetes in also important to health care providers because the earlier we identify the problem, the sooner we can make changes in diet and exercise (and sometimes insulin) to prevent complications.

- Women with an elevated risk for diabetes should be tested at the first prenatal visit and again at the usual time if the first test had a normal result.

- The average gestational age was 27 weeks at diagnosis for the Sweet Success patients seen in 2001-2002. Almost 18% of the patients were diagnosed prior to the 24-28 week period, and 45% were diagnosed after 28 weeks (see Figure 5).

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**Figure 5. Gestational Age @ DM Dx**

![Gestational Age @ DM Dx graph](image)
Gestational Age at Entry to Care

- Nearly two-thirds of patients in Sweet Success during 2001-2002 entered care after 29 weeks gestation.

- Almost all of these patients were diagnosed with impaired glucose tolerance or gestational diabetes. Gestational diabetes usually becomes apparent at 24 weeks gestation. Thus, most Sweet Success patients entered care relatively late (i.e., 5 to 10 weeks too late). Risks for mother and baby increase with late diabetes care. For example, the risk for polyhydramnios (excess water around baby) increases if a fetus is exposed to elevated glucose levels for some time; and the mother is at risk for developing type 2 diabetes if her gestational diabetes is not treated in a timely manner.

- Patients with type 1 or 2 diabetes entered care much earlier. Half (51%) of them were seen within their first 12 weeks of gestation and another third were seen within 13 to 23 weeks gestation. For patients with preexisting diabetes it is very important to receive care very early in pregnancy, i.e. within the first 8 weeks, in order to prevent birth defects. Thus, according to these statistics, the preexisting diabetic patients also entered care relatively late. One of the objectives of Sweet Success is to provide care very early in pregnancy to a larger number of patients.

- Looking at the overall 2001-2002 Sweet Success patient population, women entered care on the average at 27.6 weeks gestation (see Figure 6). Ideally they would be seen earlier to facilitate good birth outcomes.

![Figure 6. Gestational Age @ SS Entry](image-url)
GDM Management Change During Pregnancy (Prenatal)

- About 3/4 of the GDM patient's did not change their management method during their Sweet Success visits.
- The remaining 1/4 of patients did have a change in management style, requiring a change in the plan of care during that time, including going from just diet and exercise, to needing to utilize insulin. A very small portion of this group actually did use oral medications during their care, as well, or instead of insulin.

GDM Diagnosis Change after Pregnancy (Postpartum)

- All women with Impaired Glucose Tolerance (IGT) or Gestational Diabetes Mellitus (GDM) are at increased risk for type 2 and need a postpartum screen (as well as annual screening) preferably with a 75 gram Oral Glucose Tolerance Test (75 gm OGTT).
- Postprandial IGT is considered the best predictor of conversion to type 2, as well as metabolic syndrome.
- At 6-8 weeks postpartum, most women (96% of those known) who had been diagnosed IGT/GDM during their pregnancy returned to normal glucose tolerance. Four percent (4%) of the GDM or IGT patients were diagnosed type 2 postpartum. According to research done by Kjos, breastfeeding may lower blood glucose levels (and may elevate when they have weaned) (8). The breastfeeding status of these women was unknown.
- Fifty-five percent (55%) of the total GDM/IGT patients had unknown diagnoses postpartum. This may reflect the following:
  - Women did not return for postpartum follow up care.
  - Women returned for care and were tested but Sweet Success was unable to obtain the results.
  - Women were reclassified using a fasting blood sugar test only. Studies show that the fasting blood sugar test is less sensitive than the 75 gm OGTT in identifying type 2 diabetes and/or prediabetes. A woman who gets only a fasting blood sugar test may have a normal fasting sugar (< 100) but show an abnormal sugar level after. This woman misses the opportunity to make changes that can prevent of delay her from developing type 2 diabetes. She may also become pregnant again with high blood sugars and this can cause the fetus to be formed abnormally (9).
- Since the postpartum data returned to us is less than 45%, the results may not be generalizable to the entire Sweet Success population.
Method of Delivery

- Method of delivery is the medical process by which the infant was delivered.
  - Vaginal – Delivery through the vagina
  - VBAC – Vaginal birth after previous cesarean section
  - C/S, Primary – Patient’s first cesarean section
  - C/S, Rep – This is the patient’s second or subsequent cesarean section

- Over half (59%) of the Sweet Success patients delivered vaginally, and 22% of patients had a primary cesarean section (see Figure 7). In 2001, the primary cesarean section rate for the State of California was 15%, and in 2002 was 16% (10). Our goal is to have the same primary cesarean rate as that of the nondiabetic population.

- Today there are many medical reasons for a cesarean section delivery (other than just a big baby):
  - The womb doesn’t work effectively to open enough for delivery from the vagina
  - The baby doesn’t tolerate labor
  - The mother has a medical reason preventing her from delivering vaginally

![Figure 7. Method of Delivery](image-url)
Gestational Age at Delivery

- Term is considered 37-40 weeks. Preterm is defined as less than 37 completed weeks.

- The Sweet Success goal is to deliver at term to avoid complications and the increased cost of a prolonged stay in the nursery. Previously it was thought necessary to deliver the infant early to prevent stillbirth, preeclampsia, and macrosomia, because the tools were not available to monitor and control the blood glucose adequately.

- Over three-quarters of the Sweet Success patients delivered at term (see Figure 8), thus decreasing the risk of morbidity to the infant such as Respiratory Distress Syndrome, hypoglycemia (low blood sugar), and prolonged hospital stay.

![Figure 8. Gestational Age @ Delivery](image)

Birth Weight: LBW & VLBW Rates

- LBW (Low Birth Weight) is defined as birth weight between 1500 and 2499 grams. VLBW (Very Low Birth Weight) is defined as less than 1500 grams.

- LBW and VLBW are associated with Intrauterine Growth Restriction (IUGR), placental abnormalities, Pregnancy Induced Hypertension (PIH), and premature birth.

- 5% of the Sweet Success patients delivered singleton infants who were LBW, and 1% who were VLBW. In 2001, 6% of infants in the general population were LBW, while 1% were VLBW (11).

Birth Weight: Macrosomia Rates

- Macrosomia is defined as birth weight equal to or greater than 4000 grams.

- Ten percent of all US births were between 4000 and 4500 grams, and 1.5% of all births were over 4500 grams during 1998 (12).

- Approximately 10% of singleton infants born to Sweet Success patients were between 4000-4500 grams, while 3% were over 4500 grams. A decrease in the number of macrosomic infants decreases the risk of birth injury from shoulder dystocia, which can include fractured clavicles, Erb’s Palsy, and phrenic nerve palsy.
**Congenital Anomalies (Birth defects)**

- Birth defects occur in pregnancies about 3% of the time (13).

- Women who have diabetes at the time of conception, on the average, have a three fold increased rate of birth defects over that of the normal population. This is because birth defect rates increase with increasing HbA1c levels (14, 15). The increase is not from chromosomal defects, genetic link and race/ethnicity. This means that:
  - The major birth defects associated with diabetes occur before 8 weeks gestation.
  - The increased birth defect rate is seen with both type 1 and type 2 diabetes.

- All women between the ages of 14 and 50 should be cared for as if they could have a pregnancy. Preconception control (care resulting in normal blood sugars for at least 3 months before becoming pregnant) is the best preventive measure.

- According to the Sweet Success statistics from 2001-2002, only two percent of the total Sweet Success patients had babies who presented with congenital anomalies (2% of the GDM patients had infants with anomalies vs. 6% of the pre-existing diabetics’ infants).
Summary of the California Diabetes and Pregnancy Data Report

In the years 2001 and 2002 almost 12,000 women from diverse ethnic backgrounds who were pregnant and diagnosed with diabetes participated in diabetes management, education programs, and data collection at Sweet Success clinics all over California. This is a summary profile of the patients, their diabetes management, the methods of delivery, and the newborns.

Patient Characteristics
- More than half of the 12,000 women were in their thirties. About 12% were in age groups that might be considered at-risk for adverse birth outcomes, i.e. women over 40 and under 18.
- Most women were Hispanic, one quarter was White and one fifth was of Asian origin. Less than 5% were Black, in spite of strong outreach efforts to the Black community. Women of Hispanic, Asian and Black ethnicity are at increased risk for gestational diabetes.
- The majority of women seen at Sweet Success clinics were overweight (24%) or obese (42%) prior to their pregnancy, increasing the risk for numerous complications regarding their baby's health and their own. Many women in Sweet Success learned for the first time about the importance of healthy nutrition and portion control as well as appropriate exercise. While Sweet Success care emphasizes health and lifestyle education, many women lacked the social and economic support to adhere to their plan of care.

Diabetes Diagnosis
- Nearly 90% of patients were diagnosed with Gestational Diabetes (GDM) at their first visit to a Sweet Success clinic. Seven percent had type 2 diabetes and 2% had type 1.
- About 40% of the women were diagnosed at 24 to 28 weeks gestation which is the time of gestation when GDM usually develops due to hormonal and metabolic changes. Women with elevated risk for diabetes, such as previous gestational diabetes or obesity, should receive diagnostic tests earlier than 27 weeks gestation. About 20% of women in the Sweet Success clinics were indeed tested earlier in an effort to meet the needs of this at-risk population.
- Most women (45%) were diagnosed later than 28 weeks, though, suggesting a delayed process of diagnosing diabetes during pregnancy. As risks for mother and baby increase with late diabetes care, education about timely referral to Sweet Success continues to be a priority in CDAPP to facilitate good birth outcomes.

Diabetes Management
- While most women who had been diagnosed with GDM did not convert to insulin-dependent diabetes during their pregnancy, about 25% did require insulin management as the pregnancy proceeded. A very small group (2%) received oral medication for glucose control during pregnancy.
- Less than 45% of Sweet Success patients returned for post-partum diabetes assessment and education. Most of those who did return - usually within 6 weeks postpartum - showed normal glucose tolerance, and only 4% were diagnosed with type 2 diabetes at that time.
- Contrary to popular belief that GDM is a transitory condition, all women with impaired glucose tolerance or gestational diabetes are at risk for developing type 2 diabetes in the year(s) following the pregnancy. Sweet Success post-partum care includes education about preventing type 2 diabetes with balanced nutrition, exercise and stress management. Strong efforts continue to reach more women for post-partum follow-up and diabetes education.

Delivery & Birth Outcome
- More than half of Sweet Success patients had a vaginal delivery and 40% had Caesarian sections (either primary or repeat). The high-risk status of the pregnancies might explain the relatively high ratio of Caesarian sections.
- Deliveries are considered “at-term” if they occur at 37 to 40 weeks gestation. More than 80% of the deliveries in Sweet Success services occurred at-term, and 10% at 33 to 36 weeks (pre-term).
- About 6% of the singleton newborn babies were low or very low birth weight, posing a significant risk for other complications.
- Diabetes during pregnancy is often associated with excessive fetal growth, resulting in macrosomic babies. About 13% of the newborns in Sweet Success clinics during 2001-2002 were macrosomic. Given that all mothers of these babies had diabetes during the pregnancy, a 13% ratio of big babies is a favorable outcome of Sweet Success care.
Congenital Anomalies
- Two percent of the newborns whose mother had gestational diabetes showed congenital anomalies, comparing favorably to the 3% ration of congenital anomalies in the general population.
- Six percent of newborns whose mother had type 1 or type 2 diabetes showed congenital anomalies. Thus, the majority of birth defects associated with diabetes occurred prior to 8 weeks gestation when less than 7% of women had been seen for diabetes care. This finding lends emphasis to the importance of preconception diabetes control. Sweet Success clinics endeavor to provide preconception diabetes education at the post-partum visit. A 45% return rate for post-partum care (see above) is insufficient to affect the rate of congenital anomalies.

Conclusion
Sweet Success clinics all over California provide diabetes education and care to thousands of women who are at-risk for complicated pregnancies. The goal is to prevent a progression of the diabetes status and to facilitate low-risk births of healthy newborns. Most patients were indeed able to contain their blood glucose status within the limits of gestational diabetes. For many women a low-risk method of delivery could be used, and most newborns had a healthy weight. Too few women, however, are being seen for post-partum diabetes education and preconception counseling. Many women entered care relatively late due to belated diagnostic and referral processes. In addition far too few women were seen from the Black communities, and more women should be reached in other ethnic groups as well.

A few comments from Sweet Success patients are included to represent clinical significance:

“The dietitian helped me to understand how the 1 hour test relates to how my body works.”

“I liked how friendly and understanding everyone was. I liked the meal plan and suggestions on how food can be prepared.”

“I plan to adopt healthier lifestyles as a result of the program.”

“Everyone took my condition seriously and it made me realize how serious gestational diabetes can be for me and my body. This motivated me to stay on my diet and exercise routine.”
References


