Gestational Diabetes Mellitus Surveillance in Connecticut
Issue Brief

Betty C. Jung, RN MPH CHES, Connecticut Diabetes Epidemiologist

Connecticut Department of Public Health, Health Information Systems & Reporting Section

What is Gestational Diabetes Mellitus?

Gestational diabetes mellitus (GDM) is defined as "any degree of glucose intolerance with onset or first recognition during pregnancy."[1] GDM affects women the same way as type 2 diabetes, and is distinguished from women who have diabetes prior to becoming pregnant (pre-gestational diabetes).[2] Approximately 200,000 cases of GDM, representing on average 7 percent of all pregnancies, are diagnosed annually in the United States.[3]

The prevalence of GDM has increased over time. Between 1990 and 2000, GDM prevalence increased about 40 to 50 percent in the United States.[4] Researchers think this increase is related to the increase of obesity in the United States.[5] After birth, 5 to 10 percent of women with GDM continue to have diabetes.[6] About half of the women who have had gestational diabetes develop GDM in a later pregnancy.[7] About 20 to 50 percent of women with GDM will go on to develop type 2 diabetes within 5 to 10 years after delivery.[8]

Gestational Diabetes in Connecticut

During the 2003 – 2006 period, there were 167,184 births in total to Connecticut mothers, and 4.1 percent (6,890) of these births were to mothers with GDM. Most births occurred in the larger counties of Fairfield, Hartford, and New Haven; the distribution of GDM births is similar to the distribution of all births for all counties (Table 1).

Table 1. Connecticut Births by Mother's Residence, 2003 - 2006

County	All Births	% of All Births		GDM Births	% of All GDM Births
Fairfield	47,237	28.3%		1,685	24.5%
Hartford	41,687	24.9%		1,756	25.5%
New Haven	40,657	24.3%		1,794	26.0%
New London	12,399	7.2%		594	8.6%
Litchfield	7,505	4.5%		281	4.1%
Middlesex	6,894	4.1%		214	3.1%
Tolland	5,607	3.5%		295	4.3%
Windham	5,197	3.1%		271	3.9%
Total	167,183	100.0%		6,890	100.0%

Source: Connecticut Department of Public Health Vital Records Birth Files (2008).[9]

GDM births comprised 3.9 percent of White, non-Hispanic, 3.6 percent of Black, non-Hispanic, and 4.1 percent of Hispanic. A total of 8.4 percent of GDM births were categorized as Other Race/Ethnicity Connecticut births.[10]

Both nationally and in Connecticut, GDM births are more common among older mothers. The prevalence of GDM among Connecticut mothers aged 40 to 49 is 7.9 percent, versus 5.1 percent among mothers aged 30 to 39 and 3.1 percent among mothers aged 20 to 29 years.[11]

Higher educational levels are also associated with a higher prevalence of GDM. Connecticut mothers with GDM are significantly more likely to have a high school diploma or some college (90 percent) compared with mothers without GDM (87 percent).[12]

Why is GDM a Public Health Issue?

Women with GDM are at a higher risk of hypertension (high blood pressure), preeclampsia (pregnancy-induced high blood pressure, weight gain and protein in the urine), urinary tract infections, cesarean section (C-section) and future diabetes. Macrosomia (infants weighing $\geq$ 9lbs.), neural tube defects, prematurity, and subsequent childhood and adolescent obesity can affect infants of GDM pregnancies. [13] Untreated GDM has been found to increase the risk of having a child who will be obese at age 5-7 years. [14] A November 2007 Copenhagen follow-up study of adult offspring born to women with GDM found high rates of type 2 diabetes and pre-diabetes (20 percent) than among controls. Authors suggest that this could be the result of the fetus being exposed to a hyperglycemic (high blood glucose) intrauterine environment.[15] Published 2008 findings of the Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study indicate that levels of maternal blood glucose lower than what would be diagnosed as diabetes were related to clinically important perinatal disorders.[16]

As noted previously, women with GDM are at increased risk for type 2 diabetes. High pre-pregnancy Body Mass Index (BMI) and postpartum impaired glucose tolerance have also been found to be independent predictors of type 2 diabetes after GDM. [17] Recently, researchers have found that women who have had GDM may have an increased risk for developing pancreatic cancer.[18] Postmenopausal women with a history of GDM have a 70 percent increased risk for breast cancer, compared with women who had normal pregnancies.[19] GDM is also positively associated with a history of polycystic ovarian syndrome.[20]

Between 2003-2006, 31.7 percent of all Connecticut births were delivered by C-section. Mothers with GDM were significantly more likely to deliver by C-section (43.7 percent) than mothers of non-GDM births (31.2 percent). [21]

Risk Factors Associated with GDM

Major risk factors for developing GDM include increasing maternal age, family history of diabetes, history of GDM in a prior pregnancy, and increased pre-pregnancy BMI. According to the Centers for Disease Control and Prevention (CDC), during pregnancy a weight gain of 40 pounds or greater is not recommended, as it is associated with greater risk for GDM, preeclampsia and other adverse conditions and delivery complications. From 1990 to 2005, the percentage of U.S. women who gained more than 40 pounds increased from 15 percent to 20 percent.[22]

Management of GDM

There is no national consensus statement regarding the screening and management of GDM. Currently, risk-based, rather than universal screening for GDM is being recommended. GDM screening is not required for women who have all of the following characteristics: Under 25 years of age, having a normal weight before pregnancy, no history of GDM or abnormal glucose, has no first-degree family history of diabetes, not a member of a high-risk ethnic group (Hispanic, African American, Native American, Pacific Islander), and no history of poor obstetric outcome. [23]

The American Diabetes Association (ADA) 's gold standard for GDM screening is a 50-gram 1-hour glucose challenge test (GCT) at 24 to 28 weeks' gestation, followed by a 100-gram 3-hour oral glucose tolerance test (OGTT) for women who screen positive on the glucose challenge test.[24] Ninety percent of women identified with GDM were found to have a glucose value greater than the threshold value of 130 mg/dL. [25]

During pregnancy, GDM requires treatment to normalize maternal blood glucose levels.[26] Diet is the mainstay for blood glucose control.[27] Working with a dietitian or diabetes educator is helpful [28] along with scheduled physical activity, daily blood glucose testing and possibly daily insulin injections are part of good glucose control.[29] General diet recommendations include avoiding sugar, concentrated sweets and convenience foods, eating small frequent meals, eating a very small breakfast, eating high-fiber foods and lowering fat intake.[30] The ADA and the American College of Obstetricians and Gynecologists (ACOG) do not recommend oral hypoglycemic agents for GDM treatment,[31] although a recent study has found the use of metformin (alone or with supplemental insulin) was not associated with increased perinatal complications as compared with insulin.[32]

Prenatal visits are important to ensure GDM is being managed properly. Mothers with GDM who receive less prenatal care (less than 80 percent of the expected visits) were found to have a higher risk of both eclampsia (convulsions from high blood pressure) and preeclampsia (swelling and kidney problems from high blood pressure) than did mothers with GDM who received more prenatal care.[33] Connecticut 2003-2006 birth data show the prevalence of pregnancy-related high blood pressure for GDM births (5.0%) is significantly higher than for non-GDM births (2.8%).[34] The prevalence of eclampsia in GDM births (0.3 %) is significantly higher than for non-GDM births (0.1%). [35]

The Department of Public Health's Vital Statistics section [36] uses the Kotelchuck Index to measure the adequacy of prenatal care.[37] For the 2003-2006 period, the adequacy of care for GDM births (86.3 percent) was significantly higher than for non-GDM births (80.6 percent). [38] The risks of gestational hypertension (high blood pressure during pregnancy) and mild preeclampsia associated with gestational diabetes have been found to be higher among women receiving inadequate prenatal care.[39]

ADA recommends that women with GDM be screened for diabetes 6 to 12 weeks after delivery, and should be followed up with subsequent screening for the development of diabetes or pre-diabetes.[40] Postpartum screening should also include BMI, blood pressure, cholesterol and behavioral assessments to guide lifestyle modification activities to reduce the risk for type 2 diabetes and comorbidities. [41] Researchers have found that the rate of screening after delivery is just 38 percent, [42] and that the most cost-effective screening strategy for type 2 diabetes in

women with histories of GDM is to conduct an Oral Glucose Tolerance Test (OGTT) every 3 years.[43]

Currently, there is no one perinatal and postpartum screening and diagnostic criteria for gestational diabetes.[44] The U.S. Preventive Services Task Force's recent update for GDM screening still does not advocate for the screening of all pregnant women, but reports that there is limited evidence suggesting that GDM treatment after 24 weeks improves some maternal and neonatal outcomes.[45] This may change should the U.S. Congress pass the GEstational DIabetes (GEDI) Act of 2007 to fund improved data collection,[46] and if a consensus statement is developed as a result of the Hyperglycemia and Adverse Pregnancy Outcomes (HAPO) Study.[47]

The Future of Gestational Diabetes Surveillance

Preventing the development of type 2 diabetes will lessen the burden of this disease tremendously. Currently, diabetes affects nearly 24 million people in the United States, an increase of more than 3 million in approximately two years, so that nearly 8 percent of the U.S. population has diabetes.[48] Identifying individuals at greatest risk is key to the prevention of diabetes, and women with GDM are a high-risk group. Public health interventions to educate women of childbearing age about GDM and type 2 diabetes can reduce the development of these diseases.

In the coming years, the Connecticut Department of Public Health will conduct on-going surveillance activities to learn more about women who develop GDM. This information will be used to help CT Diabetes Prevention and Control Program develop prevention programs for high-risk women.

Additional Information

Centers for Disease Control and Prevention (CDC)'s Division of Diabetes Translation

- http://www.cdc.gov/diabetes/about/

Gestational diabetes listserv, contact: Michelle D. Owens, Ph.D., Behavioral Scientist. Centers for Disease Control and Prevention, Division of Diabetes Translation. E-mail: MOwens1@cdc.gov

Connecticut Diabetes Prevention and Control Program

- http://www.ct.gov/dph/cwp/view.asp?a=3135&q=397524&dphPNavCtr=|#47041
- Further information: 860-509-7801.

Connecticut Diabetes Surveillance System

- http://www.ct.gov/dph/cwp/view.asp?a=3132&q=388098&dphNav_GID=1601&dphPNavCtr=|46973|#46994

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Connecticut Department of Public Health
410 Capitol Avenue
Hartford, CT 06134-0308
http://www.ct.gov/dph
(860)509-7662

J. Robert Galvin, MD, MPH, MBA
Commissioner

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