Pre-Gestational Diabetes: A Public Health Growth Industry

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Goals for today

- 1) Recognize the importance of pre-gestational Diabetes and its magnitude
- 2) Understand the difference between pre-gestational and gestational Diabetes and the implications of each
- 3) Consider opportunities for intervention to reduce the health impact of pre-gestational Diabetes

- *I have no financial conflicts to report*
Definitions

• Gestational Diabetes (GDM)- Diabetes not detected before pregnancy but discovered during pregnancy. *Nearly all (but not all) cases are Type 2 Diabetes*

• Pre-gestational Diabetes (PGDM)- Diabetes diagnosed before conception. *Includes women with Type 1 and Type 2 Diabetes*
How big a problem is this?

- Women of child bearing age = 63M
- Prevalence of known Type 1 DM = 1%
  - 630K women
- Prevalence of known Type 2 DM = 2.9%
  - 1.8M women
- Prevalence of unknown Type 2 DM = 0.5%
  - 314K women

SO: 2.7 million women with preconception Diabetes!
Rate of new cases of type 1 and type 2 diabetes among people younger than 20 years, by age and race/ethnicity, 2008–2009

Source: SEARCH for Diabetes in Youth Study. NHW=non-Hispanic whites; NHB=non-Hispanic blacks; H=Hispanics; API=Asians/Pacific Islanders; AIAN=American Indians/Alaska Natives.

*The American Indian/Alaska Native (AI/AN) youth who participated in the SEARCH study are not representative of all AI/AN youth in the United States. Thus, these rates cannot be generalized to all AI/AN youth nationwide.
Prevalence of Type 2 Diabetes by Age
Fig. 2. Age-adjusted incidence of pre-gestational diabetes and gestational diabetes over time.

Alex Fong, Allison Serra, Tiffany Herrero, Deyu Pan, Dotun Ogunyemi

Pre-gestational versus gestational diabetes: A population based study on clinical and demographic differences ☆


http://dx.doi.org/10.1016/j.jdiacomp.2013.08.009
Fig. 4. Age-adjusted prevalence of PGDM and GDM by race/ethnicity.

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Fig. 3 Prevalence of pre-gestational diabetes compared to gestational diabetes in pregnancy by age range.

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http://dx.doi.org/10.1016/j.jdiacomp.2013.08.009
A: Risk of a major or minor congenital anomaly according to the number of SDs of GHb above normal, measured periconceptionally.
Figure 1. Hyperglycemia-induced oxidative stress. Sustained generation of reactive oxygen species (ROS) by maternal diabetes-related hyperglycemia activates p66shc by phosphorylation (+P), which further causes mitochondrial dysfunction, aggravating ROS generation.

Peixin Yang, E. Albert Reece, Fang Wang, Rinat Gabbay-Benziv

**Decoding the oxidative stress hypothesis in diabetic embryopathy through proapoptotic kinase signaling**


http://dx.doi.org/10.1016/j.ajog.2014.11.036
Maternal diabetes-induced oxidative stress activates PKC α, βII, δ, while it inhibits PKCε, ξ. Activated PKCα induces lipid peroxidation, which in turn aggravates oxidative stress, and induces apoptosis.

Peixin Yang, E. Albert Reece, Fang Wang, Rinat Gabbay-Benziv

Decoding the oxidative stress hypothesis in diabetic embryopathy through proapoptotic kinase signaling


http://dx.doi.org/10.1016/j.ajog.2014.11.036
• 3% of all births - *leading cause of infant mortality*

• 5.7% of offspring of women with type 1 DM (*Norwegian study*)

• 6.6% of offspring of women with type 2 DM (*British study*)
Relative risk (RR) for major congenital abnormalities from 14 studies of women with diabetes mellitus who did or did not receive preconception care (PCC).

Ray J et al. QJM 2001;94:435-444
Does preconception care matter?

- **PGDM w/o PCC**
  - 41.4 % pre-term
  - 7.3% with birth defects
  - 4.4% perinatal death

- **PGDM w/ universal PCC**
  - 8400 pre-term births avoided
  - 3725 birth defects prevented
  - 1900 perinatal deaths avoided
Preventable health and cost burden of adverse birth outcomes associate with PGDM in the US


• PCC for known PGDM
  – $770 M in direct medical costs
  – $3.6B in lost productivity

• PCC for undiagnosed PGDM
  – $207M in direct medical costs
  – $960M in lost productivity

SO: approximately $5.5 billion in preventable costs!
Management goals

- Pregnancy outcomes **no different** from the general population
  - There is no more motivated patient with Diabetes than a pregnant patient with Diabetes!
  - Nearly all of the work in this area focused on Type 1 patients but the future is in women with **pre-existing** Type II Diabetes
Management goals

• No unplanned pregnancies (but <50% are planned)
  – Start discussions with teenage girls early and often
  – Contraception-
    • OCA’s acceptable but must monitor for BP changes
    • IUD
    • Barrier methods
    • Abstinence?
    • Plan B
Management goals

• Pre-conception assessment- Pre-existing Diabetes
  – Complication status and stability
  – Glycemic control
  – Nutritional management awareness- CHO counting skills
  – Emotional readiness for pregnancy
  – Start folic acid early
Management goals
(Pre-gestational pre-diabetes)

• Pre-conception evaluation of at risk women
  – Previous GDM
  – Pre-Diabetes (A1C≥5.7%), HTN, ASCVD
  – Family history
  – PCOS or other insulin resistance states
  – Acanthosis nigricans
  – Overweight \((BMI>25!)\)
ADA Guidelines- 2016

• New recommendation
  – Counsel all women of child-bearing age about the importance of “near-normal” glycemia prior to conception
  – Major malformations directly proportional to HgbA1C levels in the first 10 weeks of pregnancy
  – Discuss family planning and effective contraception until the woman is prepared and ready
Pre-pregnancy evaluation: 2016 ADA Recommendations

- HgbA1C
- Serum creatinine
- Urine albumin/creatinine
- TSH
- Comprehensive eye evaluation
- Medication review for possible teratogens inc. ACE-i and statins
Management goals

• Consider modifying medical regimen if pregnancy is anticipated or if unintended pregnancy likely
  – Intensify insulin regimen/pump therapy
  – Statins, TZD’s, ACE’s and ARB’s are contraindicated in pregnancy!
  – Metformin and glyburide may be continued if achieving adequate glycemic control
The National Agenda for Public Health Action (ADA, APHA, CDC and P...) 

• 10 priority recommendations including:
  – Encourage and support state programs to develop prevention programs
  – Expand community based health promotion
  – Strengthen advocacy
  – Expand population based surveillance
  – Educate community leaders about Diabetes
  – Encourage healthcare providers to promote risk assessment...
  – Encourage access to trained professionals
  – Conduct public health research
Impediments to PCC

• General health status—women with chronic illness are more likely to have unplanned pregnancy
• Socioeconomic status including health insurance
• Co-existent tobacco and/or alcohol use
• Contraceptive use—½ of women with unplanned pregnancy were not using contraception. Low rates of use in Diabetic women
Health Literacy and Pregnancy Preparedness

• Lower health literacy linked to:
  – Lack of high school diploma
  – Lower socioeconomic status
  – Unplanned pregnancy
  – Lower probability of pre-conception discussion with endocrinologist or obstetrician
  – Lower probability of pre-conception folic acid ingestion
  – Greater probability of hospitalization during pregnancy

Endres LK et al. Diabetes Care: 27; 331-4.
And then what?

• Encourage lifestyle modification to reduce risk of persistent dysglycemia and overweight
  – 30-50% of women with GDM will develop Type 2 DM
• Encourage nursing
  – Reduction of risk by up to 50%
• Counsel on the importance of planning future pregnancies and offer birth control
Thank you!

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