There are no conflicts of interest to report.

Overview

• Epidemiology
• Diagnosis
• Management
• Co-Morbid Conditions
• Action Plan

Diabetes in America

• $245 billion: Total costs of diagnosed diabetes in the United States in 2012
• $176 billion for direct medical costs
• $69 billion in reduced productivity
• 2.3 times higher medical expenditures than what would be in the absence of diabetes
Rates of DM in Women

What's the big deal?

Age-adjusted cardiovascular disease mortality rates among the U.S. population age 35 to 74 years with and without diabetes, by cohort and sex. Mortality rates are calculated as annual deaths per 1000 persons. Error bars represent 95% CIs.

Age-adjusted all-cause mortality rates among the U.S. population age 35 to 74 years with and without diabetes, by cohort and sex. Mortality rates are calculated as annual deaths per 1000 persons. Error bars represent 95% CIs.

Figure Legend:
Age-adjusted cardiovascular disease mortality rates among the U.S. population age 35 to 74 years with and without diabetes, by cohort and sex. Mortality rates are calculated as annual deaths per 1000 persons. Error bars represent 95% CIs.

Figure Legend:
Age-adjusted all-cause mortality rates among the U.S. population age 35 to 74 years with and without diabetes, by cohort and sex. Mortality rates are calculated as annual deaths per 1000 persons. Error bars represent 95% CIs.

Visceral ADIPOSIY

- SAT: mobilized rapidly to respond to shorter-term energetic challenges
- VAT: respond to chronic metabolic challenges such as what occurs during gestation and lactation in females
Obesity and Inflammation

- A small increase in weight has a more deleterious effect on the incidence of type 2 DM in women than in men.
- Abdominal obesity leads to pro-inflammatory status through secretion of cytokines as tumor necrosis factor (TNF)-α and interleukin (IL)-6.
- Inflammation may play a more important role in the pathophysiology of type 2 DM in women than in men.

Obesity and Insulin Resistance

- Increased androgen levels induce insulin resistance in women (increase T2DM and CVD)
  - Reduced glucose uptake
  - Increased lipolysis, especially VAT
  - Elevated with central adiposity
- SHBG
  - Insulin inhibits SHBG synthesis
  - Hyperinsulinemia leads to low SHBG
  - Increased abdomin adiposity leads to low SHBG
  - High SHBG protective against T2DM W>M
- GH/IGF-1
  - Women have higher mean levels and GH pulse amplitudes
  - IGFBP-1 are higher in women (estrogen)

Obesity and Fertility


Hormonal Impact

Diabetes by Age

Prevalence
Diabetes by Age

Incidence

Body mass changes across the menopausal transition

Estrogen and IR

Diagnostic Criteria

Diagnostic Caveats

- IGT and postprandial hyperglycemia independent risk factors for CVD, in women only

- Insulin resistance manifests as
  - IFG (men) --metformin
  - IGT and postprandial hyperglycemia (women) -- acarbose
Management Considerations

- Women tend to have poorer glycemic control
- Less likely to reach a1c targets
- Higher all cause mortality

Diabetes Medications

- Sulfonylureas
  - Glimepiride (Amaryll®)
  - Glipizide (Glucotrol®)
  - Glyburide (DiaBeta®, Micronase®, Glynase®)

- Biguanides
  - Metformin

- Thiazolidinediones
  - Pioglitazone (Actos®)
  - Rosiglitazone (Avandia®)**

- GLP-1 Analogs
  - Exenatide (Byetta®)
  - Liraglutide (Victoza®)

- Dipeptidyl Peptidase 4 (DDP-4) Inhibitors
  - Sitagliptin (Januvia®)
  - Saxagliptin (Onglyza™)
  - Alogliptin (Nesina®)
  - Linagliptin (Tradjenta™)
  - Alogliptin (Similta™)

- Na-glucose co-transporter 2 (SGLT2) Inhibitors
  - INVOKANA™ (canagliflozin)

- INSULIN
Metformin

- In DPP, weight loss >3% prevents progression more effectively in men than women
- In those with T2DM, women are more successful in losing weight than men after therapy.

TZDs

- Lower CRP and leptin more in women
- Fractures are more common in women on TZDs
- Pioglitazone increases basal serum cortisol

Common Diabetes Complications

- Several studies have found diabetic retinopathy a stronger CVD risk factor in women
- Women have fewer signs of diabetic neuropathy and develop it later
- All degrees of diabetic nephropathy are less in women
  - Estrogen increases nitric oxide synthesis
  - Reduces collagen synthesis by mesangial cells
- Higher prevalence and severity of symptoms worse in women, particularly in obese women.
- Higher risk of ulcers and amputations in men, but higher mortality in women
Osteoporosis

- Similar or slightly higher BMD than controls
- Faster BMD loss in older (70 to 79 year old), white women with type 2 DM than in men with type 2 DM or in black women
- 1.5- to 2.2-fold increased RR of hip fractures compared with that in normo-glycemic women, despite higher BMD

Sexual Dysfunction

- Decreased libido and orgasmic function (diabetic neuropathy and vascular disease)
- Uncontrolled BS \( \rightarrow \) recurrent/resistant candida infections \( \rightarrow \) dyspareunia
- Decreased vibratory sensation/vaginal lubrication
- Don’t withhold local estrogen supplementation postmenopausal women with diabetes.
- Decreased self image due to diagnosis or weight

Sleep Habits

- Decreased insulin sensitivity
- Uncompensated beta cell function
- Disturbed regulation of the neuroendocrine control of appetite.
- Increased VAT

Risk of AMI in T2DM

<table>
<thead>
<tr>
<th>CVD Risk Factor</th>
<th>MEN</th>
<th>WOMEN</th>
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<tbody>
<tr>
<td>Smoking</td>
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<tr>
<td>BMI &gt; 25</td>
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<td>CVD Med &gt; 500</td>
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<td>Hypertension</td>
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<tr>
<td>CVD Med &gt; 1200</td>
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<td>1.9</td>
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<tr>
<td>Fr of CVD</td>
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<td>13.1</td>
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</tbody>
</table>

“Effect of a 10 mmHg systolic BP increase on CHD mortality”

- 30% increase in women
- 14% increase in men

Take Home Messages

1. Gestational Diabetes is a Warning—LISTEN!
2. PAUSE at Menopause
   a) Numbers Matters
   b) Exercise Does Help
3. Go to Bed!
4. Be Included…
References


Questions?

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