Disclosures

• None
Objectives

Participants will be able to:

1. Name one (1) criteria used to establish a diagnosis of Diabetes Mellitus.

2. Name two (2) interactions between Tuberculosis and Diabetes Mellitus that pose concern for positive outcomes.
What does Tuberculosis have to do with Diabetes and what does Diabetes have to do with Tuberculosis?

According to the WHO:

Diabetes (DM) worsens the clinical course of Tuberculosis (TB)

AND

TB worsens the glycemic control of DM.

DM triples the risk of developing TB.
• Diabetes effects the cell mediated immune system....
• TB loves hosts with “not so hot” immune systems....
• TB & Diabetes together have been called:
  • Double Trouble
  • Deadly Duo
Diabetes in the United States
Diagnosed and Undiagnosed Diabetes in the United States, All Ages, 2012

29.1 million people or 9.3% of the population have diabetes

- 21.0 million people are diagnosed diabetics
- 8.1 million people are undiagnosed (27.8% of people)

Number & Percentage with diabetes aged 20 years or older:

- 28.9 million or 12.3%

## Diagnosed and Undiagnosed Diabetes in the United States, All Ages, 2012

### By age

<table>
<thead>
<tr>
<th>Age</th>
<th>Number*</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>20–44</td>
<td>4.3</td>
<td>4.1</td>
</tr>
<tr>
<td>45–64</td>
<td>13.4</td>
<td>16.2</td>
</tr>
<tr>
<td>65 years or older</td>
<td>11.2</td>
<td>25.9</td>
</tr>
</tbody>
</table>

### By sex

<table>
<thead>
<tr>
<th>Sex</th>
<th>Number*</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>15.5</td>
<td>13.6</td>
</tr>
<tr>
<td>Women</td>
<td>13.4</td>
<td>11.2</td>
</tr>
</tbody>
</table>

Percentage by Racial and Ethnic Differences in Diagnosed Diabetics 20 years or older, United States, 2010–2012

Based on the 2000 U.S. standard population.
Tuberculosis in the United States
# TB Morbidity
## United States, 2008–2013

<table>
<thead>
<tr>
<th>Year</th>
<th>No.</th>
<th>Rate*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>12,895</td>
<td>4.2</td>
</tr>
<tr>
<td>2009</td>
<td>11,520</td>
<td>3.8</td>
</tr>
<tr>
<td>2010</td>
<td>11,163</td>
<td>3.6</td>
</tr>
<tr>
<td>2011</td>
<td>10,517</td>
<td>3.4</td>
</tr>
<tr>
<td>2012</td>
<td>9,945</td>
<td>3.2</td>
</tr>
<tr>
<td>2013</td>
<td>9,588</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Revised 07/02/2013 with addition of 2013 data; S.Rabley

[http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6311a2.htm?s_cid=mm6311a2_e](http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6311a2.htm?s_cid=mm6311a2_e)
Reported TB Cases by Race/Ethnicity,*
United States, 2013

- White: 15%
- Black or African American: 22%
- American Indian or Alaska Native: 1%
- Asian: 32%
- Native Hawaiian or Other Pacific Islander: 1%
- Hispanic or Latino: 29%

*All races are non-Hispanic. Persons reporting two or more races accounted for less than 1% of all cases.
Number of TB Cases in U.S.-born vs. Foreign-born Persons, United States, 1993–2013*

So..... What's up?
The New England Journal of Medicine

THE ASSOCIATION OF DIABETES AND TUBERCULOSIS*
Epidemiology, Pathology, Treatment and Prognosis
BY HOWARD F. ROOT, M.D.

(a) The development of pulmonary tuberculosis in juvenile diabetics occurred more than ten times as frequently as among non-diabetic Massachusetts grade and high school children.

(b) Pulmonary tuberculosis developed in 8 per cent of diabetic patients within three years of recovery from coma.

(c) The incidence of pulmonary tuberculosis in adult diabetics is increasing despite the general decrease of tuberculosis mortality with consequent reduction of contacts in the community.

No “special insidiousness” of signs and symptoms in the “tuberculous diabetic”

TB more frequent in those with poor diabetes control

80 Years Ago?

We have become a Fast Food Nation

#5 Combo with large fries and a large coke, please!

Can I “super size” that for you?
With the advent of fast food restaurants and the addition of “sizing-up” of portions, came the fattening of the United States. This in turn brought continued increases in weight until many persons in the US are now defined as obese.

Since obesity and diabetes go hand in hand, as obesity increases, so has diabetes in the US – and with this occurring in certain populations, who are also at risk for TB, this phenomenon is now referred to as “intersecting epidemics”.
Facts

• Diabetes increases the risk of progression from TB infection to active TB disease – due to immunosuppression (cell mediated response).

• When a diabetic has TB, treatment outcomes are worse when compared to non-diabetics, when the diabetes is not well controlled (slow responders).

• Diabetes disproportionately affects lower socioeconomic groups and ethnic minorities who also have a higher prevalence of TB.
Facts

• There tends to be lower plasma TB drug levels in persons who are diabetic.

• TB medications effect diabetic medications, causing increases in blood glucose.

• TB tend to take longer to diagnose when a person has DM.

• Diabetes is associated with other diseases that have bad outcomes regardless of the TB.

• It is estimated that 1 in 4 persons with diabetes is currently undiagnosed.
So….

- There are multiple initiatives focusing on TB and DM in different ways.

- One is an initiative in the Pacific Islands related to an TB outbreak in persons who are obese and diabetic.
- Virginia also has an initiative surrounding TB, diabetes and serum drug levels.
- There is an initiative on the Texas/Mexico border related to TB & diabetes.
- Foreign counties have established new guidelines for screening for diabetes in new TB cases (India, WHO).

- And many more…..So, what do they tell us so far?
What are the Recommendations?

• Four categories of recommendations:
  • 1. Screening for DM in persons with active TB.
  • 2. Screening for TB in persons with DM.
  • 3. Treating TB in persons with DM.
  • 4. Managing DM in persons with active TB.

This must be a coordinated effort to accomplish good TB treatment while maintaining good control of the diabetes – regardless of who accomplishes the various components.
Screening for DM in Persons with Active TB

• As a part of the personal health history, ask about DM
• As a part of the family health history, ask about DM
• As a part of the assessment, ask about symptoms of DM

• Obtaining a history is good, but the deciding factor is to test!!
1. Every person with TB over the age of 18 (20, 25) should be screened for DM.
   - A hemoglobin A1c ≥ 6.5%
   - Fasting plasma glucose ≥ 126 mg/dl
   - Two-hour plasma glucose ≥ 200mg/dl during an OGTT.
   - Random plasma glucose ≥ 200mg/dl with symptoms of hyperglycemia

2. Abnormal glucose values should be verified with a repeat test if person has no symptoms of DM.

http://care.diabetesjournals.org/content/37/Supplement_1/S14/T2.expansion.html
3. Repeat glucose testing after 2-4 weeks of TB treatment or if symptoms of hyperglycemia develop.

RIF & INH can elevate blood glucose.

Ask about polyuria and polydipsia during monitoring visits.

http://care.diabetesjournals.org/content/37/Supplement 1/S14/T2.expansion.html
Screening for TB in persons with DM

1. Persons with DM who are at increased risk of TB should be screened for TB infection and disease.
   - Conduct a TST or IGRA at time of DM diagnosis
2. Repeat as often as warranted.
3. Refer identified or suspected TB disease and/or infection to the local TB Program for management.
4. Persons with DM and LTBI should be encouraged to accept and complete treatment.
   - Assure persons receive B₆ if on INH (neuropathy)
Treating TB in Persons with DM

1. Ensure that TB treatment medications are properly dosed.
   Monitor creatinine for adjustments in EMB & PZA as needed.
   B₆ to prevent neuropathy (INH & DM related).
   Obtain therapeutic drug levels as needed.

2. Observe closely for treatment failure.
   Be aware of poor absorption of TB meds in DM
   Manage the many interactions between TB meds and DM meds
   Drug resistance is questionable in persons with DM – not supported by literature review by WHO
Treating TB in Persons with DM

3. Consider conducting therapeutic TB drug levels after the first 2 weeks of TB medications & adjust dosing as needed.

4. “Consult the Experts” if the person has cavitary disease, delayed sputum conversion or is considered to be a “slow responder”. Must consider extending TB treatment or increasing the frequency of doses.
Managing DM in Persons with Active TB

1. Recommend repeating glucose levels weekly for several weeks, then less frequently. Optimum would be weekly for the first 4 weeks & then monthly.

2. Reinforce lifestyle changes at each visit (dietary changes, physical activity, etc.).

3. Refer to the Diabetes or other appropriate clinic for long-term diabetic care. Coordinate closely with the MD.

4. Use DOT visits to encourage lifestyle changes.
Conclusion

• Persons with DM and TB require careful management of both diseases simultaneously!
• Currently, there are no standard recommendations for managing TB in diabetic patients.
• Uncontrolled DM adversely effects the overall treatment outcomes for person with active TB.
• For optimal TB outcomes, DM must be controlled.
• Referral, close coordination and care management between TB care providers and DM care providers is essential to “Assure the Cure”.
Think TB!

failure to thrive

Recognize possible signs and symptoms of Tuberculosis. Early diagnosis and treatment reduces spread. Contact your Health Department or physician for more information.

U.S. Department of Health and Human Services
Public Health Service

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HIV

Diabetes Mellitus


Questions?