**TB Nurse Case Management**
San Antonio, Texas
March 7 – 9, 2012

*Tuberculosis Complicated by Diabetes*
Barbara Seaworth, MD
March 8, 2012

*Barbara Seaworth, MD* has the following disclosures to make:

- No conflict of interests
- No relevant financial relationships with any commercial companies pertaining to this educational activity
Tuberculosis Complicated by Diabetes

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Objectives

• Identify the impact of DM on the risk of LTBI and TB disease.

• Recognize the impact of rifampin on control of DM due to drug effect on blood sugar and drug interactions with oral diabetic agents

• Discuss the impact of DM on TB treatment outcomes
Number and Percentage of U.S. Population with Diagnosed Diabetes, 1958-2008


Age-adjusted percentage of adults aged ≥20 years with diagnosed diabetes, 2007

MMWR 58:1259-1263, 2009
Table:

Prevalence of Diagnosed Diabetes by Race/Ethnicity and Age in Persons 18 & Older

<table>
<thead>
<tr>
<th>AGE</th>
<th>White non-Hispanic</th>
<th>Black, non-Hispanic</th>
<th>Hispanic</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>18–44</td>
<td>2.9</td>
<td>3.0</td>
<td>4.3</td>
<td>1.4</td>
</tr>
<tr>
<td>45–64</td>
<td>10.4</td>
<td>23.8</td>
<td>20.9</td>
<td>13.9</td>
</tr>
<tr>
<td>65+</td>
<td>17.0</td>
<td>33.5</td>
<td>34.8</td>
<td>28.7</td>
</tr>
<tr>
<td>Overall</td>
<td>8.3</td>
<td>13.0</td>
<td>11.1</td>
<td>8.1</td>
</tr>
</tbody>
</table>

» Texas Diabetes Fact Sheet, 2009

Diagram:

Age-adjusted Percentage of U.S. Adults Who Were Obese or Who Had Diagnosed Diabetes

Diabetes

- Globally urbanization has fueled an increasing incidence of diabetes in Africa, India, Asia and the U.S.

  - Areas of world with high rates of tuberculosis

  - By 2030 it is estimated that 80% of diabetes will be in areas of the world with the highest rates of TB

Case Study

- 36 yr old Latino woman with close exposure to an infectious individual with drug susceptible TB

- She has a long history of diabetes

- Is she more at risk than other contacts?
Does Diabetes Predispose to TB?

**DOES TB INCREASE THE RISK OF DIABETES?**

YES! - Diabetes Predisposes to TB

- Hong Kong prospective study of 4661 close contacts of active TB cases
  - RR 3.4 in diabetics for both
    - early – primary progressive disease (3 month)
    - and late - reactivation (within 5 years) disease

Lee MS, Int J Tuberc Lung 2008
Diabetes: a Moderate to Strong Risk Factor for TB

• 2008 Meta analysis
  
  – 13 studies many areas of world showed increased risk of TB in persons with diabetes
    • 3 prospective cohort studies showed RR 3.1
    • 8 case-control studies and 2 other types- OR 1.2-7.8
  
  – Association of Diabetes and TB stronger
    • When the background TB incidence is higher
    • In younger age groups
    • In Central America, Asia, Europe

Jeon, PLoS Medicine, 2008

Relative Risk for Diabetes: CDC

Table 3. Relative risk* for developing active tuberculosis (TB), by selected clinical conditions

<table>
<thead>
<tr>
<th>Clinical condition</th>
<th>Relative risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicosis</td>
<td>30 (37-39)*</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>2.5-4.5 (2.2-4.4)</td>
</tr>
<tr>
<td>Chronic renal failure/hemodialysis</td>
<td>10.0-25.3 (15-41)</td>
</tr>
<tr>
<td>Gastroscopy</td>
<td>2-5 (45-47)</td>
</tr>
<tr>
<td>Jejunoileal bypass</td>
<td>27-63 (40-49)</td>
</tr>
<tr>
<td>Solid organ transplantation</td>
<td></td>
</tr>
<tr>
<td>Renal</td>
<td>37 (50)</td>
</tr>
<tr>
<td>Cardiac</td>
<td>20-74 (51,52)</td>
</tr>
<tr>
<td>Carcinoma of head or neck</td>
<td>16 (53)</td>
</tr>
</tbody>
</table>

* Relative to control population; independent of tuberculin-test status.
† Numbers in parentheses are reference numbers.
Risk of TB Related to Degree of Diabetic Control

- Actuarial probability of developing TB was 24% in IDDM and 4.8% in NIDDM

Prospective study in Tanzania, diabetic patients followed 1 – 7 years

- 9.0% IDDM versus 2.7% NIDDM developed pulmonary TB

Olmos, Rev Med Chil 1989

Linkage Between Tuberculosis and Diabetes

- No increase risk of LTBI
- Increased risk of developing active TB disease

Patient diagnosed with Diabetes → Immune Response is weakened → Exposure to M. Tuberculosis → No increase risk of LTBI

Wild, Diabetes Care 2004
Latent TB Infection (LTBI) in Diabetic Patients

- Persons with diabetes should be screened for TB with an IGRA or TST

- Communicate risk of progression to disease to community physicians caring for diabetics

- If LTBI is found, treat for latent infection
  - INH for 9
    - Be sure to include Vitamin B6
    - Neuropathy is complication of diabetes and toxicity of INH
  - Rifampin or the new 3 HP regimen can be considered

Growing Diabetic Epidemic Will Have a Significant Impact on TB Control
Global Prevalence of Tuberculosis and Diabetes, 2008

**Tuberculosis**
- 12.7 million people (9.4 WHO 2010)
- 95% in developing countries

**Diabetes Mellitus**
- 171 million people (285 WHO 2010)
- 70% in developing countries

(Source: World Health Organization, 2008)

Projected prevalent DM incidence & TB Incidence

Figure: Projected prevalent diabetes cases and current worldwide tuberculosis incidence. Estimated number of people with diabetes mellitus in 2005 compared with WHO projections are shown. Tuberculosis incidence per 100,000 population data for 2007 are shown. Data from International Diabetes Federation and WHO.\(^\text{T1}\)

Dooley, & Chaisson, Lancet ID, Dec, 2009
Global Rising Tide of Diabetes

• Millions of Cases in 2000 and Projected Cases for 2030, with Projected Percent Change.

- United States and Canada
- Europe
- Middle East
- Sub-Saharan Africa
- Latin America and the Caribbean
- Asia

EXCELLENCE • EXPERTISE • INNOVATION
At Risk Populations and Behaviors for TB and Diabetes

**TB**
- HIV/AIDS
- Immune Suppression
- Alcohol and Drug Abuse
- Homeless Population
- Refugees
- Prisoners
- Migrant Farm Workers
- Health Care Workers

**Diabetes**
- Native Americans
- Hispanics
- Asian / Pacific Islanders
- Blacks
- Older Persons
- Unhealthy Diet
- Smoking
- Vitamin D deficiency

Other risk factors for TB and Diabetes

- **Smoking**
  - Active smoking associated with significant increase in risk of diabetes RR 1.4
    » Will, JAMA 2007
  - Exposure to passive smoke increases RR 1.81
    » Hayashino, Diabetes Care, 2008
  - Asia 50-60% of male population smokes

- **Vitamin D deficiency**
  - Increases risk of type 1 and type 2 diabetes
  - Also associated with active TB
    - Odds ration 2.9
    - Deficiency may lead to TB and vice versa
      » Wilkinson, Lancet 2000
TB and Diabetes: Is Vitamin D the Missing Link?

- 1 billion people worldwide are Vitamin D deficient due to decreased sun exposure or inadequate intake
  - CDC notes decline in adults who have adequate levels of Vitamin D
    - 30% whites, 5-10% blacks

- Vitamin D is thought to affect pancreatic β cell function and immune response
  - Low concentrations associated with insulin resistance and glucose intolerance
  - Deficiency increases risk of type 1 & type 2 diabetes
  - Supplementation is protective against both types

Vitamin D Deficiency in Adults

- Who should be tested?
  - Decreased intake (poor nutrition)/Limited sun exposure
  - Gastrointestinal illness with malabsorption
  - Hepatic disease
  - Chronic renal disease (GFR < 60%, nephrotic syndrome)
  - Aging
  - Diabetics?
    » Kennel et al, Mayo Clinic Proc; August 2010
Presentation of TB in Diabetics

- Various reports of more severe disease

- Varying findings as to the radiographic presentation
  - ? More cavities
  - ? Isolated lower lung involvement

Classic Article Prior to Availability of TB Medications
Howard Root MD, Deaconess Hospital, Boston
NEJM, 1934

Autopsy series of 126 patients: no pathological findings unique to “the tubercular diabetic”

245 TB cases in diabetic patients, “no special insidiousness” of signs or symptoms and similar CXR findings to non-diabetics

Noted that TB developed most frequently in patients with poor diabetic control

Dooley, & Chaisson, Lancet ID, Dec, 2009
### TB and Diabetes, CXR Findings

<table>
<thead>
<tr>
<th>Year</th>
<th>Study location</th>
<th>Participants (n)</th>
<th>With diabetes</th>
<th>Without diabetes</th>
<th>Lesion long more commonly involved</th>
<th>More cavitary lesions?</th>
<th>More diffuse involvement?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td>USA</td>
<td>20</td>
<td>182</td>
<td>Yes</td>
<td>--</td>
<td>--</td>
<td>--</td>
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<tr>
<td>1980</td>
<td>South Africa</td>
<td>91</td>
<td>137</td>
<td>Yes</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>1992</td>
<td>Japan</td>
<td>70</td>
<td>71</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>--</td>
</tr>
<tr>
<td>1992</td>
<td>Texas USA</td>
<td>20</td>
<td>20</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>--</td>
</tr>
<tr>
<td>1994</td>
<td>Turkey</td>
<td>37</td>
<td>37</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>--</td>
</tr>
<tr>
<td>1996</td>
<td>Cameroon</td>
<td>--</td>
<td>17</td>
<td>Yes</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>1997</td>
<td>Saudi Arabia</td>
<td>28</td>
<td>18</td>
<td>No</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>2001</td>
<td>Turkey</td>
<td>92</td>
<td>92</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
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<tr>
<td>2006-01</td>
<td>Mexico</td>
<td>152</td>
<td>130</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>--</td>
</tr>
<tr>
<td>2013</td>
<td>Saudi Arabia</td>
<td>187</td>
<td>546</td>
<td>Yes</td>
<td>--</td>
<td>--</td>
<td>--</td>
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<tr>
<td>2014</td>
<td>Taiwan</td>
<td>74</td>
<td>14</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>--</td>
</tr>
<tr>
<td>2014</td>
<td>Saudi Arabia</td>
<td>57</td>
<td>78</td>
<td>--</td>
<td>No</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

*50% each*

Table 2: Studies assessing chest radiographic findings in patients with tuberculosis, comparing diabetic to non-diabetic patients

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### Case Study

- **Contact has + TST 20 mm induration**
- **CXR is read as normal**
- **Patient notes several weeks of dry cough but is otherwise well**

- **INH treatment started**
Case Study

• 3 months later:
  – Fever
  – Productive cough
  – Hemoptysis
• Smear + for AFB
• CXR notes right upper lobe opacity and a cavity
• Culture positive M TB resistant to INH
What Complicates Her TB Treatment?

What Changes in Her Case Management Should be Considered?

Case Study

• What are factors to consider in her management?
  – INH treatment
  – HBA1C = 8.9%
  – Metformin and Glyburide, poorly adherent
  – Overweight with poor diet
  – Extent of disease
  – Absorption of TB medications
Does Diabetes Impact TB Treatment Outcomes?

• Previously thought not to affect treatment outcomes

• Four new studies from Baltimore, Texas, Taiwan and Indonesia reveal:
  – Delayed culture conversion
  – Higher mortality
    – Dooly, 2009; Restrepo 2008; Wang 2008; Alisahlanda, 2007

Response to Treatment

• Relapse may be more frequent
  – Recent Shanghai study - 203 diabetics with TB followed for 2 years after standard treatment

  • 20% relapse rate in patients with DM (most Type 2)
  • 5% relapse rate in patients without DM

  Zhang et al. Jpn J Infect Dis, 2009
Impact of Diabetes on Tuberculosis Treatment Outcomes

- A Systematic Review of 33 studies:
  - Diabetes is associated with an increased risk of failure and death during TB treatment.
  - Diabetes is associated with an increased risk of death – 4.95 greater – in the studies that adjusted for age and other potential confounding factors.
  - Diabetes is associated with an increased risk of relapse (RR 3.89)
    - Baker et al. Bio Med Central, Medicine, 2011

TB and DM Outcomes: Relapse

<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Population with DM Relapsed/ Total</th>
<th>Population without DM Relapsed/ Total</th>
<th>RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wada, 2000 [54]</td>
<td>Japan</td>
<td>761 (11%)</td>
<td>4084 (1%)</td>
<td>8.15 (2.46, 26.97)</td>
</tr>
<tr>
<td>Msoussa, 2003 [47]</td>
<td>Congo</td>
<td>6/17 (35%)</td>
<td>97/7 (12%)</td>
<td>3.02 (1.24, 7.35)</td>
</tr>
<tr>
<td>Singh, 2006 [50]</td>
<td>Saudi Arabia</td>
<td>2/130 (2%)</td>
<td>3/9 (7%)</td>
<td>1.60 (0.32, 11.14)</td>
</tr>
<tr>
<td>Maalj, 2009 [48]</td>
<td>Tunisia</td>
<td>45/5 (7%)</td>
<td>182/1 (1%)</td>
<td>5.60 (0.68, 51.95)</td>
</tr>
<tr>
<td>Zhang, 2009 [57]</td>
<td>China</td>
<td>33/165 (20%)</td>
<td>91/70 (5%)</td>
<td>3.78 (1.87, 7.65)</td>
</tr>
<tr>
<td>Summary</td>
<td></td>
<td></td>
<td></td>
<td>3.78 (2.43, 6.22)</td>
</tr>
</tbody>
</table>

Heterogeneity I-squared = 0% (0, 79)
Weights are from random effects analysis

Hyperglycemia in Patients with TB

- High glucose at TB diagnosis may not be diabetes

- Blood glucose control may worsen while patients are taking Rifampin
  - Rifampin augments intestinal absorption of glucose
  - Does so in both diabetics and non-diabetics

- Infections impair glucose tolerance early in disease in both diabetics and non-diabetics
  - Independent of rifampin, infection can lead to poor glucose control
Low Blood Levels of Rifampin in Diabetics: Indonesia

- 17 Patients with Diabetes and Tuberculosis

- Rifampin levels decreased 50%
  - Perhaps related to higher BMI in diabetics

- Is a different dose of rifampin needed?
  - Mg/kg?
    - Hanneke M. J. Nijland Clinical Infectious Diseases, 43 2006

Pharmacokinetics of TB Drugs in Pulmonary TB in Type 2 DM

- 18 diabetic pts in intensive phase of treatment matched with 18 gender and weight matched non-DM pts

  - Earlier study found peak levels and mean exposure over time to Rifampin was 2 fold lower in pts with DM
    - Higher body weight and higher blood sugar found in these patients
      - Ruslami, Antimicrob Ag and Chemother, Mar 2010
Rifampin Levels in Diabetics and Non Diabetics Matched by Weight

- Rifampin
- PZA
- Ethambutol

Antimicrob Agents Chemotherapy 2010

Treatment Issues – Rifampin Effect of Anti-diabetic Medications

- Rifampin induces CYP450 enzyme system increasing production of enzymes that metabolize many drugs
  - Increased metabolism results in lower blood levels of drug (20 – 40+%)
  - Affects many classes of diabetic medications
Induction of Cytochrome P450 (CYP) by Rifampin

Fig. 1. Effects of rifampin on cytochrome P450 (CYP) enzyme mRNA expression in primary human hepatocytes as determined by oligonucleotide-based microarrays. Induction was calculated as the normalised ratio of expression in rifampicin-treated versus vehicle control-treated cells (from Rae et al., Clini Pharmacokinet 2003: 42 (9).

Effects of Rifampin on Anti-diabetic Drugs

<table>
<thead>
<tr>
<th>Interacting drug</th>
<th>Subjects (n), study design</th>
<th>Rifampin (mg/d)</th>
<th>Results</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glibenclamide (glyburide)²⁹</td>
<td>Healthy (10), randomised crossover</td>
<td>600 x 5d</td>
<td>31% ↓ in AUC, 22% ↓ in Cmax, 17% ↓ in t1/2; 44% ↓ in blood glucose decremental AUC; 36% ↓ in maximum ↓ of blood glucose</td>
<td>Monitor blood glucose carefully and increase dosage as necessary</td>
</tr>
<tr>
<td>Gliptid³⁰</td>
<td>Healthy (10), randomised crossover</td>
<td>600 x 5d</td>
<td>34% ↓ in AUC, 25% ↓ in t1/2</td>
<td>Monitor blood glucose carefully and increase dosage as necessary</td>
</tr>
<tr>
<td>Glipizide³⁰</td>
<td>Healthy (10), randomised crossover</td>
<td>600 x 5d</td>
<td>22% ↓ in AUC, 18% ↑ in Cmax, 35% ↓ in t1/2</td>
<td>Monitor blood glucose carefully and increase dosage as necessary</td>
</tr>
<tr>
<td>Repaglinide²⁹ (Prandin)</td>
<td>Healthy (8), randomised crossover</td>
<td>600 x 5d</td>
<td>57% ↓ in AUC, 41% ↓ in Cmax, 21% ↓ in t1/2; blood glucose decremental AUC↓ by 1.2 mmol * h/l, 37% ↓ in maximum ↓ of blood glucose</td>
<td>Monitor blood glucose carefully and increase dosage as necessary</td>
</tr>
</tbody>
</table>

AUC = area under the concentration-time curve; Cmax = peak concentration; d = days; t1/2 = elimination half-life; ↑ indicates increase; ↓ indicates decrease.

Clin Pharmacokinet 2003; 42 (9)
TB and Diabetes - Treatment Issues

- **Diabetic neuropathy** at baseline complicates therapy due to risk of INH-related neuropathy
  - Baseline assessment of neuropathy
  - Vitamin B 6 to all diabetics on INH or ethionamide

- **Gastroparesis**
  - Vomiting and slow emptying could prevent good drug levels

- **Renal insufficiency** is associated with diabetes, especially long standing or poorly controlled DM
  - Adjust dose and dosing interval of EMB & PZA (Crt Cl < 30)
TB and Diabetes - Treatment Issues

- Diabetics have an increased risk of hepatotoxicity
  - Multiple medications
  - Fatty liver

- Monitoring and education are very important
  - Baseline and monthly liver enzymes
  - Educate regarding risk of liver toxicity, symptoms to watch for, and what to do should these occur
    - Contact provider
    - Hold TB medications until liver injury excluded
Should Treatment be Different?

• No data to make comprehensive recommendations on diabetics
• Case by case decision:
  – Intensity of dosing during initial and continuation period
  – Duration of therapy
  – Monitoring during treatment
    • ? Drug levels if slow to convert

Case Study

• Cultures and smears convert shortly after 2 1/2 months of therapy
• Nausea and occasional vomiting - ? GERD
• CXR improves slowly, cavity closes
• Rifampin level - trace
• New positive smears and cultures at 4 months, repeat confirms
Does Diabetes Increase the Risk of TB?

Does TB INCREASE THE RISK OF DIABETES?
No evidence to suggest that having tuberculosis or taking medications for tuberculosis increases the risk for diabetes

Increased hyperglycemia with active disease and with rifampin-induced medicine interactions, does not lead to development of diabetes

How Big?

• TB has never been big enough to really grab the world’s interest except for outbreaks of MDR in the 1990’s and now XDR TB in recent years

• HIV is really big as it affects many more people but-----

• Diabetes is huge and it’s impact on TB incidence and control may be greater than the impact of HIV
Diabetes cases may double by 2050
And perhaps triple, with 1 in 3 having the disease
--By Mary Brophy Marcus, USA TODAY
October 22, 2010

The future of diabetes in America looks bleak, according to a new Centers for Disease Control and Prevention report out today, with cases projected to double, even triple, by 2050, according to the report, one in 10 U.S. adults have diabetes now. The prevalence is expected to rise sharply over the next 40 years with as many as one in three having the disease, primarily type 2 diabetes, according to the report, published in the journal Population Health Metrics.

“There are some positive reasons why we see prevalence going up. People are living longer with diabetes due to good control of blood sugar and diabetes medications, and we’re also diagnosing people earlier now,” says Ann Albright, director of the CDC’s Division of Diabetes Translation.

A more diverse America — including growing populations of minority groups such as African Americans and Hispanics, who are more at risk for the disease — factors into the increase as well, Albright says. But an increasing number of overweight Americans is also fueling the stark predictions for diabetes, which should be taken seriously, Albright says.

Diabetes and Tuberculosis: Mexico

Prospective population based evaluation - pulmonary TB in Veracruz Mexico, using molecular epidemiological data

- Risk of TB in diabetics was increased 7 times
- Risk was increased in both reactivation and new infection

Authors concluded that:

- Increased risk due to diabetes is comparable to that found in other studies attributable to HIV
- Tuberculosis-attributable risk due to HIV was 2% compared with 25% due to diabetes

Ponce-de-Leon, 2004 “TB and Diabetes in Southern Mexico”, Diabetes Care
Impact of Diabetes Epidemic on TB Incidence

- Epidemiological model to assess potential impact of diabetes as risk factor for incident pulmonary TB using India as example

- 2000 there were 20.7 million adults with diabetes and 900,000 with pulmonary TB
  - Model suggests diabetes accounts for 14.8% of pulmonary TB
  - And for 20.2% of smear positive TB
  - Increased TB in urban areas
    - is associated with a 15.2% greater smear + TB incidence vs rural

  » Stevenson et al, BMC Public Health, 2007

Impact of Diabetes Epidemic on TB Incidence

- “In India, HIV accounts for 3.4% of adult tuberculosis incidence, the proportion we estimate to be attributable to diabetes is 14.8%”

- “The current diabetes epidemic may lead to a resurgence of tuberculosis in endemic regions, especially in urban areas”

- “It is time that the “unhealthy partnership” of tuberculosis and diabetes receives the attention it deserves”

  » Stevenson et al, BMC Public Health, 2007
Consultation meeting on tuberculosis and diabetes mellitus: meeting summary and recommendations

S-E. Ottman,* M. B. Murray,† M. A. Baker, ‡ A. Kapur, § K. Lönnroth, * A. D. Harries* *

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SUMMARY

The steadily growing epidemic of diabetes mellitus (DM) poses a threat for global tuberculosis (TB) control. Previous studies have identified an important association between DM and TB. However, these studies have limitations: very few were carried out in low-income countries, and none in Africa, raising uncertainty about the strength of the DM-TB association in these settings, and many critical questions remain unanswered. As a result of these questions and uncertainties, the International Union Against Tuberculosis and Lung Disease (The Union), the World Diabetes Foundation and the World Health Organization Stop TB Department undertook a series of consultations as of January 2009. A systematic review and meta-analysis was undertaken by the Department of Epidemiology, Harvard School of Public Health between May and August 2009, and a consultation meeting involving the experts who reviewed the report took place at The Union Headquarters in Paris on 6 and 7 November 2009. This paper constitutes a summary of the findings, the research gaps and prioritised areas of research, and the recommendations from that meeting.

KEY WORDS: diabetes mellitus; tuberculosis; meeting report; screening; treatment outcomes
Recommendations

• Detect and manage TB in patients with Diabetes
  – Intensify detection of TB among people with diabetes
    • As a minimum screen all for chronic cough
    • Screening for active TB on broader indications – research
      • Increase awareness and knowledge of interactions
  – Ensure TB infection control in health-care settings where diabetes is managed
  – Ensure high quality TB treatment in people with diabetes

Recommendations

• Detect and manage diabetes in patients with TB
  – Screen TB patients for diabetes
  – Ensure high-quality diabetes management among TB patients
What Can We Offer in TB Clinics?

- Include glucose or HB A1C on blood work.
- Educate on need to follow a healthy eating plan.
- Encourage physical activity for 30 to 60 minutes/day.
- Stress the importance of taking medicines as directed.
- Encourage patients to quit smoking.
- Refer for regular physician visits.
- Educate on need for daily foot check for cuts, blisters, sores, swelling, redness, or sore toenails.