TB and Comorbidities
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TB Nurse Case Management
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Adriana Vasquez, MD has the following disclosures to make:

- No conflict of interests
- No relevant financial relationships with any commercial companies pertaining to this educational activity
Video
Retrovirus Replication 3D Animation Boehringer

Agenda

• TB and HIV
• TB and DM
• Genitourinary TB
• TB in patients with chronic kidney disease
• TB in patients with liver disease
A guide to monitoring and evaluation for collaborative TB/HIV activities

WHO policy on collaborative TB/HIV activities
Guidelines for national programmes and other stakeholders

Worldwide tuberculosis is the leading cause of death among people living with HIV.
Epidemiology HIV/TB

- An estimated 1.2 million HIV+ fell ill with TB in 2015
- One third of deaths among PLHIV were due to TB
- 75% of HIV/TB co-infected patients reside in Africa

http://www.who.int/tb/areas-of-work/tb-hiv/tbhiv_factsheet_2016_web.pdf?ua=1

Person with TB HIV and Bipolar Disorder

- 30-year-old Hispanic male who was referred to TCID for treatment of pulmonary tuberculosis in the setting of HIV+ (2004), bipolar disorder, HCV, substance abuse and homelessness.
  - Normal chest x-ray although delay in producing a sputum.
  - Sputum AFB smear negative cultures positive for pan-susceptible MTB.
Hospital Course

• Admitted to TCID and
  – Started on INH/PZA/EMB and Rifabutin.
  – Became manic and left AMA 5 days later

• Readmitted under court order one month later

• After 2 weeks the patient was started on antiretroviral therapy with
  – Ritonavir, Darunavir and Truvada
• Developed IRIS, treated with prednisone

CXR 6 weeks after ART  CXR at the end of Therapy
Treatment Outcomes Person with TB HIV Bipolar Disorder

- Completed TB treatment at TCID under court
- Discharged with undetectable HIV viral load
- Discharged with psychiatry and HIV physician follow up

HIV Associated Tuberculosis

- Persons co-infected with TB and HIV are 19 times more likely to develop active TB disease than persons without HIV
  - HIV co-infection is the most powerful risk for progression from LTBI to TB disease
- TB is the most common presenting illness among people living with HIV
- TB is the leading cause of death among people living with HIV

» http://www.who.int/tb/areas-of-work/tb-hiv/tbhiv_factsheet_2016_web.pdf?ua=1
COLLABORATIVE TB/HIV ACTIVITIES: RESPONSE & PROGRESS

- HIV testing should be offered to all patients with TB
- Antiretroviral therapy (ART) should be given to all TB patients living with HIV, irrespective of their CD4 counts.
- People living with HIV are facing emerging threats of drug-resistant TB such as MDR and XDR-TB

http://www.who.int/tb/areas-of-work/tb-hiv/tbhiv_factsheet_2016_web.pdf?ua=1

Clinical Presentation of TB in HIV

<table>
<thead>
<tr>
<th>Clinical picture</th>
<th>Early Stage HIV</th>
<th>Late Stage HIV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Often resembles post-primary pulmonary TB</td>
<td>Often resembles primary pulmonary TB</td>
</tr>
<tr>
<td>Sputum Smear</td>
<td>Often positive</td>
<td>More likely to be negative</td>
</tr>
<tr>
<td>Chest x-ray</td>
<td>Upper lobe infiltrates with or without cavitation</td>
<td>Infiltrates any lung zone, no cavitation, miliary; normal</td>
</tr>
</tbody>
</table>
Recommended Regimen

- Intensive phase with RIPE for 2 months
- Continuation phase with INH and rifampin for 4 months
- Prolong therapy to 9 months for patient with
  - Positive cultures at 2 months or delayed treatment response
  - Patients not receiving ART during TB therapy
- Once weekly INH and rifapentine should not be used


Effects of HIV on TB

- HIV is the most potent risk factor for TB
- HIV and TB → AIDS-defining illness
- Low CD4 count increases TB risk
- HIV infection accelerates TB progression
- HIV increases the risk of extra pulmonary and disseminated TB
- TB is more difficult to diagnose in HIV+ patients
  - HIV increases the number of sputum smear-negative TB

Effect of TB on HIV

- TB increases the risk of death in HIV+ patients
- TB increases plasma HIV viremia
- TB Increases expression of the HIV co receptors CCR5 and CXCR4 in HIV-infected patients


Immune Reconstitution Inflammatory Syndrome-IRIS

- Paradoxical: Exacerbation of known disease
- Unmasking: Manifestation of disease not previously known
- Rates in TB: 8-40%
- Risk for IRIS increases with:
  - Initial CD4 <50 with good response in CD4 after ART
  - High viral load prior to ART with quick suppression on ART
  - Severity of TB disease and extra pulmonary disease
  - Starting ART within 30 days of TB treatment
- Usually occurs within 2-3 weeks of starting ART
  - Although really depends on when the immune system recovers

» Guidelines for the Use of Antiretroviral Agents in HIV-1-Infected Adults and Adolescents, August 2015
Immune Reconstitution: Symptoms

- Manifestations:
  - Lymphadenopathy
  - Fever
  - Cough
  - Worsening pulmonary infiltrates
  - CNS tuberculosis
  - Pleural effusion
  - Abscesses
- Robust T cell response to inflammatory cytokines
- Symptoms last a median of 2 months and are usually self-limited
- Mortality is rare

Immune Reconstitution: Diagnosis and Treatment

- Diagnosis of exclusion
  - Differential includes
    - Lymphoma
    - Drug reaction
    - Treatment failure
    - Other infection
- Treatment
  - Mild – NSAIDS
  - Severe – Steroids (prednisone 1 mg/kg/day)
    - Compromised airway
    - Circulatory collapse
  - Don’t stop TB treatment or ART per guidelines

» Guidelines for the Use of Antiretroviral Agents in HIV-1-Infected Adults and Adolescents, Nov 13, 2014
**ART is Recommended in all HIV-Infected Persons with TB**

- Person already on ART, start TB treatment immediately
  - Adjust ART to reduce risk of drug-drug interactions

- ART-naïve patients
  - CD4 count is <50 cells/mm³, Start ART within 2 weeks of starting TB therapy
  - CD4 count >50 cells/mm³, Start ART by 8 to 12 weeks

- Patients with TB meningitis, ART SHOULD NOT be initiated before 8-10 weeks TB treatment is initiated, regardless of CD4 count

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**Drug Interactions: Rifamycins and TB Treatment**

- Rifampin interacts with many medications use to treat HIV

- Rifabutin can be substituted for rifampin to decrease the drug-drug interaction with ART

- As new ART agents and more pharmacokinetic data become available, these recommendations are likely to change

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Guidelines for the Use of Antiretroviral Agents in HIV-1-Infected Adults and Adolescents, August 2015


Managing Drug Interactions in the Treatment of HIV-Related Tuberculosis.
Case Management

- Consult an expert in management HIV and TB
- Close attention to adherence to ART and TB meds
- Drug-drug interactions
- IRIS
- Side effects of medications
- TB treatment failure and relapse


TB and Diabetes
Diabetes and Tuberculosis – Introduction

- Patients with diabetes, incidence of Tuberculosis 2-4 x higher
- 80% of people with DM live in developing world
- 10% of TB cases globally are linked to DM
- Both disease states tend to complicate one another
**DIABETES: FACTS AND FIGURES**

Worldwide 2015: 415 million people with diabetes

2040: 642 million people with diabetes

North America, and Caribbean: 41.3 million
Europe: 139.6 million
Middle East and North Africa: 53.4 million
South and Central America: 29.6 million
Africa: 64.2 million
Western Pacific: 133.2 million
South East Asia: 308.2 million


**Source:** IDF Diabetes Atlas Seventh Edition 2015

- Every 6 seconds, 1 person dies from diabetes
- 5.0 million deaths in 2015
- $673 billion
- 52% of global health expenditure is spent on diabetes
- 3/4 of people with diabetes live in low and middle-income countries

Prevalence of Diabetes in Persons with TB

<table>
<thead>
<tr>
<th>Region</th>
<th>TB Patients w/ Diabetes</th>
<th>Year Published</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karnataka State, India</td>
<td>32%</td>
<td>2011</td>
</tr>
<tr>
<td>Kerala State, India</td>
<td>44%</td>
<td>2012</td>
</tr>
<tr>
<td>Tamil Nadu State, India</td>
<td>25%</td>
<td>2012</td>
</tr>
<tr>
<td>Texas, USA</td>
<td>39%</td>
<td>2011</td>
</tr>
<tr>
<td>Mexico</td>
<td>36%</td>
<td>2011</td>
</tr>
<tr>
<td>Tanzania</td>
<td>17%</td>
<td>2011</td>
</tr>
<tr>
<td>Pakistan</td>
<td>16%</td>
<td>2012</td>
</tr>
<tr>
<td>South Pacific</td>
<td>40-45%</td>
<td>2013</td>
</tr>
</tbody>
</table>


The Impact of Diabetes on Tuberculosis Treatment Outcomes:

- A systematic Review of 33 studies:
  - Diabetes is associated with an increased risk of treatment 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 3.89 greater
    » Baker et al. Bio Med Central, Medicine, 2011
Pathophysiology DM and TB

• Altered immune system
  – Altered phagocytosis and
  – Abnormality in chemotaxis and opsonization

• DM an independent risk factor for lower respiratory tract infection

• Hyperglycemia is associated with higher pathogen virulence Relative
• Immunosuppression of DM may unmask latent TB infection

Drug Pharmacokinetics

• Challenges associated with TB treatment in Diabetes
  – Absorption: Gastroparesis and malabsorption
  – Comorbidities CKD, Cardiovascular disease, Non-alcoholic Steatohepatitis
• Rifampin: Strong hepatic enzyme inducer leading to decreased drug levels
  – Sulfonylureas, Thiazolidinediones, meglitinides
### Rifamycins and Cardiovascular Agents: Drug – Drug Interactions

**General Considerations:**

Rifamycins are metabolized by the CYP3A4/5 (P450) enzymes. Rifampin, the parent drug, is the most potent inducer of the CYP3A4/5 P450 and accounts for most of the drug interactions. Rifampin is a weaker inducer of the CYP2D6 P450, potentially explaining why some of the earlier studies using Rifampin in chronic administration may have had more drug interactions.

**Adverse Effects:** Rifampin increases serum levels of Warfarin, resulting in possible bleeding. Rioflavin and Rifabutin do not affects Warfarin levels to the same extent.

### Drug Interactions with Rifampin

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Interaction</th>
<th>Clinical Implications</th>
</tr>
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<tbody>
<tr>
<td>Warfarin</td>
<td>Increased AUC</td>
<td>Increased bleeding risk</td>
</tr>
<tr>
<td>Metformin</td>
<td>Decreased levels</td>
<td>Reduced efficacy</td>
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<tr>
<td>Fosphenytoin</td>
<td>Increased levels</td>
<td>Risk of toxicity</td>
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### Drug Interactions with Rioflavin

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<td>No significant interaction</td>
<td>No reduction in efficacy</td>
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<tr>
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<td>No increased bleeding risk</td>
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### Drug Interactions with Rifabutin

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<td>No increased bleeding risk</td>
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*Note: Additional caution should be used when administering these agents in close proximity to patients with liver disease or renal insufficiency.*

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### Rifamycins and Anti-Diabetic Agents: Drug-Drug Interactions

**General Considerations:**

Rifamycins are metabolized by the CYP3A4/5 (P450) enzymes. Rifampin, the parent drug, is the most potent inducer of the CYP3A4/5 P450 and accounts for most of the drug interactions. Rifampin is a weaker inducer of the CYP2D6 P450, potentially explaining why some of the earlier studies using Rifampin in chronic administration may have had more drug interactions.

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**Adverse Effects:** Rifampin increases serum levels of Warfarin, resulting in possible bleeding. Rioflavin and Rifabutin do not affects Warfarin levels to the same extent.

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**Note:** Rifampin is a strong inducer of the CYP3A4/5 P450 and can decrease the levels of many anti-diabetic agents, leading to reduced efficacy. Rioflavin and Rifabutin are weaker inducers and do not significantly affect the levels of anti-diabetic agents.
Managing TB in Persons with DM

- TB medication absorption is poor in people with DM
  - Consider drug levels
- Extend TB treatment to 9 months if slow culture conversion or clinical response
- If diabetic nephropathy is present change the frequency of pyrazinamide and ethambutol
- Administer B6 to prevent INH induced peripheral neuropathy
- Observe closely for TB treatment failure

Managing DM in Persons with TB

- Check glucose and HbA1C
- Reinforce life style changes diet and exercise
- Refer patients to diabetes clinic for long-term DM care
- Review drug interactions between DM medications and rifampin, adjust doses accordingly
World Health Organization Recommends Bidirectional Screening

• All people with TB should be screened for DM
  – Fasting/random blood sugar or 2 hour glucose tolerance test
  – HgbA1c

• All newly diagnosed patients with DM need screening for TB symptoms, further workup if clinically and epidemiologically indicated
  – Radiograph
  – Sputum smear microscopy or other tests

• Healthy weight
• Balance diet
• Smoking
• Stress and depression
• Waist circumference, High risk for DM and heart disease:
  > 40 inches for men
  >35 inches for women
• Sleeping patterns: Both short <6h and > 9h associated with DM

Patient with TB-DM-CKD

- 46 y/o M with DM disseminated TB involving lungs, both ureters and kidneys
  - Kidney failure, creatinine 8, ureteral strictures
  - Respiratory failure
- Discharged with bilateral nephrostomy tubes
- Multiple UTI’s
Initial and End of TB Treatment CXR

Genitourinary TB - Epidemiology

• 10% of TB cases are extra pulmonary
  – 40% of extra pulmonary TB are GU TB
  – Second only to lymph node involvement
• 25-62% with military disease have renal lesions
• More common in men than women
Genitourinary TB

- Dysuria and microscopic hematuria present 90% of cases
- Ureteral stricture
  - Obstructive uropathy, hydronephrosis
- Chronic epididymitis, prostatitis
- Infertility
  - Seminal vesicles and fallopian tubes
- May be irreversible

Genitourinary TB – Diagnosis

- 3-6 first morning urine samples for AFB smear, culture, PCR
- 11-80% of urine AFB cultures are positive in patients with active TB
- TB PCR of urine or renal tissue
  - Sensitivity 87-100%, Specificity 93-98%
  - No commercial NAAT approved by FDA for urine studies
Genitourinary TB - Diagnosis

• Radiology
  – Beading of the ureters
  – Ureteral stricture
  – Hydronephrosis
  – Contracted bladder
  – Calcification of prostate, kidneys

TB IN PERSONS WITH CHRONIC KIDNEY DISEASE (CKD)
**Chronic Kidney Disease Increases TB Risk**

- Increased risk of progression from latent to active TB with chronic kidney disease (CKD)

- Difficulty diagnosing & treating patients on dialysis

- Symptoms often mistaken for complications of dialysis
  - Cough (congestive heart failure, fluid overload), fever (bacterial infection)

  - Atypical presentation
    - Extra pulmonary TB, especially abdominal TB common

**TB Screening in Persons with CKD**

- TB skin test or IGRA
  - At diagnosis of CKD
  - Thirty days prior to admission to hemodialysis unit
  - Thirty days prior to scheduled renal transplant
  - Annual/periodic
    - If TST negative Two step should be done

  » California TB Controller Association (CTCA) Recommendations
CXR Findings in Persons with TB and CKD

- In late stage CKD cavitations, upper lobe infiltrates are less common

- CXR may be normal or atypical
  - Infiltrate lower lobes, diffuse, miliary, resembling pulmonary edema, pleural effusions

Presentation of TB in Persons on Dialysis

- Atypical presentation of pulmonary TB
  - Fever – most common sign!
  - Weight Loss
  - Anorexia
  - Cough (may be present)

- Consider TB Disease in ANY patient with:
  - Recurrent pneumonia
  - Pneumonia not improved within 2 weeks of antibiotics – avoid fluoroquinolones May mask TB!
Presentation of TB in Persons on Dialysis

• Extra pulmonary TB
  – More common in dialysis patients
  – Don’t forget to do SPUTUMS!!
  – Abdominal – (Peritoneal, liver, bowel, adenopathy)
    • TB peritonitis can be difficult to distinguish from bacterial
  – Any site possible - evaluate if abnormal

<table>
<thead>
<tr>
<th>Drug</th>
<th>Change in frequency?</th>
<th>Change in dosage if creatinine clearance ≤30 ml/min or for patients receiving hemodialysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isoniazid</td>
<td>No change</td>
<td>300 mg once daily, or 900 mg three times per week</td>
</tr>
<tr>
<td>Rifampin</td>
<td>No change</td>
<td>600 mg once daily, or 600 mg three times per week</td>
</tr>
<tr>
<td>Pyrazinamide</td>
<td>Yes</td>
<td>25–35 mg/kg per dose three times per week (not daily)</td>
</tr>
<tr>
<td>Ethambutol</td>
<td>Yes</td>
<td>15–25 mg/kg per dose three times per week (not daily)</td>
</tr>
<tr>
<td>Levofloxacin</td>
<td>Yes</td>
<td>750–1,000 mg per dose three times per week (not daily)</td>
</tr>
<tr>
<td>Cycloserine</td>
<td>Yes</td>
<td>250 mg once daily, or 500 mg/dose three times per week*</td>
</tr>
<tr>
<td>Ethionamide</td>
<td>No change</td>
<td>250–500 mg/dose daily</td>
</tr>
<tr>
<td>p-Aminosalicylic acid</td>
<td>No change</td>
<td>4 g/dose, twice daily</td>
</tr>
<tr>
<td>Streptomycin</td>
<td>Yes</td>
<td>12–15 mg/kg per dose two or three times per week (not daily)</td>
</tr>
<tr>
<td>Capreomycin</td>
<td>Yes</td>
<td>12–15 mg/kg per dose two or three times per week (not daily)</td>
</tr>
<tr>
<td>Kanamycin</td>
<td>Yes</td>
<td>12–15 mg/kg per dose two or three times per week (not daily)</td>
</tr>
<tr>
<td>Amikacin</td>
<td>Yes</td>
<td>12–15 mg/kg per dose two or three times per week (not daily)</td>
</tr>
</tbody>
</table>
Treatment of Active TB in Persons with CKD

- **Initial Phase (first two months):**
  - INH 300mg daily or 900 mg thrice weekly
  - Rifampin 600mg daily or thrice weekly
  - Ethambutol 15-25mg/kg thrice weekly
  - PZA 25-35mg/kg thrice weekly
  - Vitamin B6 50mg thrice weekly

- **Continuation**
  - INH and Rifampin x 4 – 7 months

- **All doses should be given AFTER DIALYSIS**

Airborne Infection Isolation (AII)

- Consider isolating patient during evaluation phase

- If dialysis center does not have isolation room patient may need to have inpatient dialysis

- AFB Smear Positive patients should be isolated until
  - 3 consecutive negative sputum specimens at least 8 hours apart
  - On appropriate treatment as indicated by drug susceptibilities
    - minimum of 14 days
  - Responding clinically to treatment
TB in Patients with Liver Disease

- Likelihood of drug induced hepatitis may be higher
- TB may involve the liver, and hepatic abnormalities may improve with TB treatment

TB Treatment in Patients with Advanced Liver Disease

- Likelihood of drug induced hepatitis may be higher
- TB may involve the liver, and hepatic abnormalities may improve with TB treatment

» Treatment of Tuberculosis : MMWR, June 20, 2003
**TB Regimen Recommended for Persons with Advanced Liver Disease**

- Treat with only one potentially hepatotoxic drug
  - Rifamycins should be retained
  - Additional agents include ethambutol, fluoroquinolone, cycloserine, amikacin
- Treatment duration with such regimens should be 12-18 months, depending on the extent, medications used and disease response
- Obtain TB expert consultation

» Treatment of Tuberculosis : MMWR, June 20, 2003

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**TB Treatment without PZA in Persons with Liver Disease**

- PZA can cause severe and prolonged liver injury

- Treat with INH, rifampin and ethambutol for 2 months follow by a continuation phase with INH and rifampin for 7 months

» Treatment of Tuberculosis : MMWR, June 20, 2003
Conclusions

• Encourage HIV patients to have HIV viremia goal undetectable and discuss TB meds with HIV doctor

• Encourage patients to adhere to ART / diabetes/ BP medications

• Encourage diabetic patients to have HbA1C goal < 7% and discussed TB meds with DM doctor

• Obtain consultation when treating TB patients with HIV infection, CKD and advance liver disease

Questions?

Thanks for your attention
References

- Treatment of Tuberculosis : MMWR, June 20, 2003

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Therapeutic drug monitoring in anti-tuberculosis treatment: a systematic review and meta-analysis.

Mota L1, Al-Chalil R2, Campbell JRF, Cook VA, Mera P3, Johnston J1.

@ Author information

Abstract

BACKGROUND: Therapeutic drug monitoring (TDM) may improve tuberculosis (TB) treatment outcomes, but there is little evidence to guide TDM in clinical practice.

DESIGN: We performed a systematic review and meta-analysis to summarise existing literature on TDM in first-line drugs.

RESULTS: We identified 41 studies that reported 2 h peak drug concentrations (C2h) for first-line drugs and 12 studies that reported clinical outcomes. We pooled data by study quality, design, region, dosing modality and patient characteristics. The pooled proportion of subjects with low isoniazid C2h was 0.43 (95% CI 0.32-0.55), 0.67 (95% CI 0.60-0.74) had low rifampicin C2h, 0.27 (95% CI 0.17-0.38) had low ethambutol C2h, and 0.12 (95% CI 0.07-0.18) had low pyrazinamide C2h. Patients with diabetes had a non-significant increase in the proportion of subjects with low C2h levels across all four drugs. Only three of 12 studies that examined clinical outcomes demonstrated an association between low C2h and unsuccessful treatment outcomes.

CONCLUSION: Across a wide variety of studies, a high proportion of patients undergoing first-line anti-tuberculosis treatment had 2 h drug concentrations below the accepted normal threshold. These findings point to a discrepancy between accepted 2 h TDM thresholds and TB drug dosing recommendations.
Relative Risk of TB by Selected Clinical Conditions: 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>2.0–4.1 (42–44)</td>
</tr>
<tr>
<td>Chronic renal failure/hemodialysis</td>
<td>10.0–25.3 (39–41)</td>
</tr>
<tr>
<td>Gastrectomy</td>
<td>2–5 (45–47)</td>
</tr>
<tr>
<td>Jejunoileal bypass</td>
<td>27–63 (46–49)</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 (52)</td>
</tr>
</tbody>
</table>

*Relative to control population; independent of tuberculin test status.
*Numbers in parentheses are reference numbers.
HIV-Associated TB
Key Challenges In 2015

KEY CHALLENGES

- 57%
  - One third of deaths among PLHIV were due to TB
  - Of all HIV-positive TB cases did not receive care according to reported data
  - IPT reported in only 57 countries as part of global efforts to prevent TB in PLHIV


TB and Smoking
Tobacco Related Mortality

- Cigarette smoking causes about one of every five deaths in the United States each year
- Life expectancy for smokers is at least 10 years shorter than for nonsmokers
- Quitting smoking before the age of 40 reduces the risk of dying from smoking-related disease by about 90%

Tobacco use is the leading preventable cause of death in the United States

CDC tobacco data

Tobacco Related Morbidity

Cancer
- Oropharynx
- Larynx
- Esophagus
- Trachea, bronchi, and lung
- Acute myeloid leukemia
- Stomach
- Liver
- Pancreas
- Kidney and ureter
- Cervix
- Bladder
- Colorectal

Chronic Diseases
- Stroke
- Blindness, cataracts, uveitis-related macular degeneration
- Congenital defects—maternal smoking: oral/ceilial clefts
- Periodontitis
- Aortic aneurysm, carotid artery disease
- Atherosclerosis in young adults
- Coronary heart disease
- Pneumonia
- Atherosclerotic peripheral vascular disease
- Chronic obstructive pulmonary disease, tuberculosis, asthma, and/or other respiratory effects
- Diabetes
- Reproductive effects in women (including reduced fertility)
- Hip fractures
- Obstetric pregnancy
- Male sexual function—erectile dysfunction
- Rheumatoid arthritis
- Immune function
- Overall diminished health
Systematic Reviews and Meta-Analyses
Evaluating tuberculosis and Cigarette Smoking

• Approximately 13% of the TB cases in the world each year may be attributable to tobacco exposure.

• “Tobacco cessation must become an integral part of all TB control programs.”

Explore Ways to Quit Smoking

• Sign up for SmokefreeTXT, at smoke free.gov
  – 24/7 advice, tips and encouragement to quit
• Call 1-800-QUIT-NOW (1-800-784-8669)
Prevalence, drug-induced hepatotoxicity, and mortality among patients multi-infected with HIV, tuberculosis, and hepatitis virus

Pingzheng Mo*, Qi Zhu*, Caroline Teter*, Rongrong Yang*, Liping Deng*, Yajun Yan*, Jun Chen*, Jie Zeng*, Xi-en Guo*

• TB patients have a higher infection rate of HIV.
• HIV-positive TB patients have a higher rate of HCV infection.
• HIV, HBV and HCV are risk factors for the development of abnormal LFTs.
• HIV, HBV and HCV are risk factors for mortality during TB treatment.

» IJID Vol. 28, Nov 2014, 95-100

The Three I’s for HIV/TB

• Intensified case finding for TB
  – Every HIV + patient needs to screen for TB
• Isoniazid preventive therapy (IPT)
  – Is recommended for all HIV + patients with LTBI
• Infection control must be implemented by all health facilities offering HIV care services.

• People living with HIV need early diagnosis and treatment of active TB disease.
  – WHO recommends use of Xpert MTB/RIF as the initial diagnostic test for people living with HIV who have TB signs and symptoms

http://www.who.int/tb/challenges/hiv/tbhiv_factsheet_2014.pdf?ua=1
Genitourinary TB

- TB infection of kidneys, GU tract
- Sterile pyuria, hematuria
- Urine 3-6 first morning urine sample smear, culture, PCR
- Complications:
  - Stricture, CKD, infertility

- Radiology: calcified caverns in prostate or kidney, “beading” of ureters, hydronephrosis, ureteral stenosis

> Up to Date