Cost-effectiveness of Isoniazid Preventative Therapy for HIV-infected Pregnant Women in India

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Background

- Pregnancy increases the risk of developing active tuberculosis (TB) in HIV-infected women
- TB/HIV co-infection can result in increased morbidity and mortality for both mother and child
- Isoniazid preventative therapy (IPT) may reduce progression to active TB in HIV-infected individuals
- Globally, India has the highest number of incident TB cases and 3rd highest burden of HIV.
- The cost-effectiveness of IPT for HIV-infected pregnant women in India is unknown.

Objectives

To evaluate the costs and effects of the following three strategies for TB prevention:
- **Intervention 1:** IPT for all HIV-infected pregnant women irrespective of CD4 count
- **Intervention 2:** IPT for HIV-infected pregnant women with CD4+ T-cell counts ≤ 200 cells/µl
- **Standard of Care:** No IPT for HIV-infected pregnant women

Methods

We performed an economic evaluation from the health-system perspective using a decision tree analytic model to determine the cost-effectiveness of antepartum IPT among HIV-infected pregnant women in India.

Study Population: HIV+ Pregnant Women

- Assumed that all women were on a triple drug regimen of anti-retroviral therapy (ART) [Option B+]

Study Parameters:

- **Value** | **Base Case** | **Source**
- **Epidemiologic, Diagnostic, and Treatment Parameters**
  - Prevalence of Latent TB: 0.21 | [1, 2]
  - 5-year Risk of Progression from LTBI to Active TB in Patients with CD4 >200 cells/µl (vs. patients with CD4 <200 cells/µl): 0.25 (0.238) | [2-4]
  - Relative Risk Reduction of 6 Months IPT on LTBI Progression Rate: 0.63 | [2-4]
- **IPT and Active TB Treatment Costs (2014 USD)**
  - 6 Months of IPT: $22.77 | [5, 6]
  - Active TB Treatment: $95.39 | [5, 6]

*Not all references are shown

Overview of Model

- **Target Population:** Pregnant Women
- **Interventions 1:** IPT for all HIV-infected pregnant women.
- **Interventions 2:** IPT for HIV-infected pregnant women with CD4 ≤ 200 cells/µl
- **Standard of Care:** No IPT for HIV-infected pregnant women

- **Primary outcomes:** anticipated costs, disability-adjusted life years (DALYs), active TB cases, and TB related deaths.
- **Cost-effectiveness:** represented using incremental cost-effectiveness ratios (ICERs), and compared to a willingness-to-pay threshold of Indian per capita GDP (i.e. $1500 per DALY-verted).

- Both IPT interventions for HIV-infected pregnant women were considered highly cost-effective compared to no IPT ($78 per DALY-verted and $201 per DALY averted for Intervention 1 and 2, respectively).
- Intervention 1 (IPT for all HIV-infected pregnant women irrespective of CD4 count) resulted in the greatest improvement in health outcomes.

Results

- **Costs ($/USD)**
  - **Net Costs (per individual)**
    - Intervention 1: $225.33 (205.02-396.27)
    - Intervention 2: $205.36 (200.69-496.83)
    - Standard of Care: $200 (300.49-409.40)
  - **Incremental**
    - TB or Death (deaths per 1000 pts)
      - Intervention 1: $1.49 (0.53-7.85)
      - Intervention 2: $0.90 (0.32-3.91)
      - Standard of Care: $2.09 (0.40-4.60)
    - Active TB (deaths per 1000 pts)
      - Intervention 1: $1.67 (0.30-11.13)
      - Intervention 2: $2.01 (0.61-4.64)
      - Standard of Care: $200 (300.49-409.40)

- **Variable** | **Intervention 1 vs Standard of Care ($/DALY averted)**
  - **Costs ($/USD)**
    - DALYs (per individual): 0.55 (0.65-0.49)
    - TB or Death (deaths per 1000 pts): $2.02 (0.30-11.13)
    - Active TB (deaths per 1000 pts): $2.02 (0.30-11.13)

- **Effectiveness (ICERs)**
  - **Incremental**
    - Intervention 1: $45.82 (17.79-8.67)
    - Intervention 2: $2.27 (1.03-3.71)
    - Standard of Care: $35.02 (12.9-65.82)

- **Probabilistic sensitivity analysis (PSA):**
  - PSA used Monte-Carlo simulation methods to simultaneously vary all parameters across their range of values to generate a cost-effectiveness acceptability curve

Conclusions

- **One-way sensitivity analysis:**
  - Base case values were varied by literature estimates or for parameters with limited published data, by varying the base-case value by 25%
  - Tornado diagrams show the model parameters that were found to have the most effect on the ICER at base-case for both interventions, compared to the standard of care

- **Probabilistic sensitivity analysis:**
  - Both interventions, the base-case ICER was most sensitive to parameter estimates for the 5-year risk of progression from LTBI to active TB
  - There were no conditions in which IPT for all HIV-infected pregnant women was not considered cost-effective
  - TST driven strategies were also explored and found to be cost-effective for both Intervention 1 and 2 (ICER: $76 ± $31 per DALY averted respectively)

Acknowledgements and Literature Cited

**Funding Support Provided by:** NIAID/NIMH HIV Trials Unit (UM1-AI069465), NIH AIDS Research (UM1-AI069465), The Howard Hughes Medical Institute (5K23AI089259), NICHD (5U13) CRDF/NIH, Wyncote and Gilead Foundations, the Johns Hopkins AIDS Research Center, the National Institutes of Health, National Center for Advancing Translational Sciences, the National Cancer Institute, the National Institute on Drug Abuse, and the National Institute on Aging.

**Literature Cited:**