TB in South African mines

ILO/ WHO Consultation to promote the engagement of workplaces
12th October 2009

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The Aurum Institute

- Independent public benefit organisation that originated in the South African gold mining industry

- Mission: “An internationally respected African institution that transforms health in the community.”

- TB and HIV prevention and treatment

- Medical research and health systems management
Overview

- Epidemiology of TB in miners
- TB control amongst miners:
  - INH preventive therapy
  - Active case finding
- TB risk reduction in HIV-infected miners:
  - INH preventive therapy
  - Active case finding
  - Antiretroviral therapy
Epidemiology HIV and TB
TB in South African miners

incidence per 100 000 pop p.a.
Risk factors for TB incidence

**Age**
- <40: 2.2
- >40

**HIV**
- -ve
- +ve*

**Silicosis**
- No
- Early
- Advanced*

*p trend <0.001

* remained significant in multivariate analysis

TB risk with HIV & silicosis

(Corbett EL, *AIDS* 2000;14:2759-68)
Silicosis & TB case fatality

(Churchyard GJ, *Int J Tuberc Lung Dis*, 2000;4;705-712)
Duration of infectiousness

Smear +ve TB
- HIV+ve
- HIV-ve

All forms of TB
- HIV+ve
- HIV-ve

Mean duration (years)

0.17
1.15
0.8
2.39

TB recurrence

Kaplan Meyer graph by HIV status

- Re-infection accounted for 68% of recurrence
  \( (N=609, \text{FU} = 1.02 \text{ years}) \)

Strategies to reduce TB incidence
Strategic framework for TB control

Preventive therapy
- Reduce latent TB prevalence

HIV prevention
- Reduce HIV incidence/prevalence

Increase active case finding
- Reduce active TB prevalence

Reduced burden of disease, health care and compensation costs

Better dust control
- Reduce silicosis prevalence

Reduce rate of TB in HIV +ves

Diagnose HIV & treat with ART

Reduce TB transmission

Reduce institutional TB transmission

(Churchyard GJ, Corbett EL. Handbook of Occupational Health. SIMRAC, 2001)
Passive TB case finding

- Asymptomatic, does not seek care
- Symptomatic, does not seek care
- Symptomatic, seeks care
- Smear neg, culture neg
- Smear neg, culture pos
- Smear pos, culture pos

Morbidity and infectiousness relationships.
Active TB case finding

- Asymptomatic
  - Smear neg, culture neg
  - Smear neg, culture pos
  - Morbidity

- Symptomatic, does not seek care

- Symptomatic, seeks care
  - Smear pos, culture pos

Morbidity
Infectiousness
Active case finding

<table>
<thead>
<tr>
<th></th>
<th>Miners (general)</th>
<th>HIV-infected miners</th>
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</thead>
<tbody>
<tr>
<td>N</td>
<td>1960</td>
<td>899</td>
</tr>
<tr>
<td>TB Prevalence</td>
<td>54 (2.7%)</td>
<td>44 (4.9%)</td>
</tr>
<tr>
<td>Sensitivity</td>
<td></td>
<td></td>
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<tr>
<td>Specificity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>%</td>
<td></td>
<td>%</td>
</tr>
<tr>
<td>Symptoms*</td>
<td>29.4</td>
<td>59.1</td>
</tr>
<tr>
<td>Symptoms &amp; CXR</td>
<td>49.0</td>
<td>90.9</td>
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</tbody>
</table>

*Symptoms: Night sweats, cough or reported weight loss

Community INH preventive therapy (IPT): Thibela TB

Standard TB control

Standard TB control

plus

Community wide IPT
Community-wide IPT (Bethel district, Alaska)

Passive CFT
INH RCT: 42% pop INH 12mos
INH all residents

TB incidence rate per 100,000 pop pa

Year

Community-wide IPT
(Bethel district, Alaska)
Preliminary results: Enrollment

% consenting of cluster

recruitment month

8th cluster

5th, 6th and 7th clusters

3rd and 4th clusters

1st and 2nd clusters

N ~27,500
Reasonable retention is achievable

Clusters

1st & 2nd

3rd & 4th

5th - 7th

Proportion still in the study vs. days since first dispensed INH
INH is safe

- 23,585 pts started INH between July 06 – 31Mar 09
- 126 adverse events recorded
  - 60 hypersensitivity
  - 49 peripheral neuropathy
  - 14 hepatitis
  - 3 convulsions
- 4 SAEs
  - 3 hepatitis; 1 definitely related
  - 1 convulsion; possibly related
- 33 deaths
  - 31 not related
  - 1 possibly related
  - 1 relationship to INH not coded
INH resistance

(Van Halsema, IAS Cape Town 2009)
Strategies to reduce the risk of TB among HIV positive miners
Effectiveness of IPT pre-ART

(Grant AD, JAMA, 2005; 293:2719-2725)
Effectiveness of IPT pre-ART

Adjusted IRR 0.54 (0.35-0.83)

pre-clinic phase
IR: 10.9/100PYO

post-clinic phase
IR: 8.4/100PYO

(Grant AD, JAMA, 2005; 293:2719-2725)
Antiretroviral therapy

TB incidence (first episode) following ART initiation

Days since ART initiation

TB cases/100pyrs
INH preventive therapy on ART

Kaplan-Meier survival estimates

Unadjusted analysis
3.5/100pyrs vs 9.8/100pyrs
Hazard ratio: 0.37 (95%CI 0.25-0.54)

Adjusted analysis
Hazard ratio: 0.57 (95%CI 0.38-0.88)
Conclusions

- Miners high burden of disease due to dual risk factors: silicosis and HIV infection
- Additional strategies are required to control TB:
  - Active case finding
  - INH preventive therapy may be an additional mechanism
- HIV infected individuals
  - ART
  - INH preventive therapy
Acknowledgments

Aurum Institute for Health Research
Prof. G J Churchyard
Dr D Clark
Dr F Randera
Dr L Coetzee
V. Chihota
Dr C. Van Halsema
Dr J. Day
M. Luttig
T. Crawford
K. Mngadi

London School of Hygiene and Tropical Medicine
Dr K Fielding
Dr A Grant
Dr L Corbett
Dr J Lewis
Dr Y Hanifa
Resources

• Medical surveillance of silicosis and silica-related diseases. Expert Group Meeting. 2008