HEALTH SCREENING FOR TUBERCULOSIS AMONG NEW HEALTHCARE WORKERS IN LEEDS TEACHING HOSPITAL NHS TRUST

MFOM DISSERTATION 2013
Dr T Bakare
Questions I wanted To Answer

1. What is the prevalence of active and latent TB in NHCWs/students screened by LTHT-OHS (October 2008 to September 2010).

2. What is the prevalence of active and latent TB among NHCWs from high TB incidence compared to low TB incidence countries.

3. What is the impact of introducing Quantiferon / IGRA test on referrals made to the Leeds chest clinic compared to when Mantoux test was being used.

4. What recommendations are relevant to the delivery of TB screening within OHS.
Study Description/Data Collection

Descriptive Cross Sectional Study; 2 Parts: A & B

Part A:
- All health questionnaires received by OHS between Oct 2008 and Sept 2010 were identified (7059)
- Those who had IGRA/QFN test performed had notes pulled out (305)
- Those with complete information were used for the study (244)
- Information collected from cohort, paper notes, chest clinic reports etc.
- Anonymised data
- Unique code number.
- No contact was made with the subjects.
- No consent required from individual study subjects
Inclusion Criteria

1. Employees who are new to the NHS who have arrived from a high TB prevalence country, within the last 5 years, and have lived in the UK for less than 5 years.

2. Employees who are new to the NHS, who have lived in a country of low prevalence for TB (Including the UK) for more than 5 years who did not have a BCG scar but have positive Mantoux result.

3. Employees who may not be new to the NHS but are arriving from or have lived in a country of high prevalence in the last 5 years, e.g. those returning from electives overseas.
Exclusion Criteria

- All cases of TB contact tracing, i.e. those who are already employed who had Quantiferon test performed following contact with an index case of TB.

- Clients who had QFN test performed for reasons other than NHCW TB screening.
Study Description/Data Collection: Part B

- All referrals to the Leeds chest clinic 2 years before IGRA was introduced
- IGRA officially introduced in April 2009
- All referrals to the Leeds chest clinic 2 years after IGRA was introduced
- Compared rate of referral, chemoprophylaxis uptake and completion rates in both groups.
NICE 2006/11 TB SCREENING GUIDELINE

New NHS Employee
Not a NE from HIC
No BCG
Pt /Clinical specimen contact

TST

Neg.

Positive

Individual R/A for HIV
Offer BCG (Green Book)

Clinical Assessment
CXR
Refer Chest Clinic
Latent/Active TB treatment

New NHS Employee
NE from HIC
BCG or Not
Pt /Clinical Specimen contact

CXR (previous)

IGRA

Positive

Individual R/A for HIV
Offer BCG (Green Book)

Neg.
Latent / Active TB Infection

Latent TB

- Presence of M. tuberculosis organisms without signs and symptoms or radiographic or bacteriologic evidence of TB disease.

Active TB

- Fever, cough, night sweats, weight loss,
TST (Mantoux Test)
IGRA

- Surrogate marker of TB infection
- Measures cellular immune response to Mycob. TB specific proteins
- Cannot distinguish between Active and Latent TB
IGRA

Quantiferon Gold test

Sensitised T Cell in blood

Gamma interferon release measured by ELISA. Quantitative result
## Interpretation of IGRA Results

<table>
<thead>
<tr>
<th>Interpretation</th>
<th>Nil*</th>
<th>TB Response†</th>
<th>Mitogen Response§</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive†</td>
<td>≤8.0</td>
<td>≥0.35 IU/ml and ≥25% of Nil</td>
<td>Any</td>
</tr>
<tr>
<td>Negative**</td>
<td>≤8.0</td>
<td>&lt;0.35 IU/ml or &lt;25% of Nil</td>
<td>≥0.5</td>
</tr>
<tr>
<td>Indeterminate††</td>
<td>≤8.0</td>
<td>&lt;0.35 IU/ml or &lt;25% of Nil</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td></td>
<td>&gt;8.0</td>
<td>Any</td>
<td>Any</td>
</tr>
</tbody>
</table>

* The interferon gamma (IFN-γ) concentration in plasma from blood incubated without antigen.
† The IFN-γ concentration in plasma from blood stimulated with a single cocktail of peptides representing early secretory antigenic target-6 (ESAT-6), culture filtrate protein-10 (CFP-10), and part of TB 7.7 minus Nil.
§ The IFN-γ concentration in plasma from blood stimulated with mitogen minus Nil.
† Interpretation indicating that *Mycobacterium tuberculosis* infection is likely.
** Interpretation indicating that *M. tuberculosis* infection is not likely.
†† Interpretation indicating an uncertain likelihood of *M. tuberculosis* infection.
**T-Spot test**  *(Source- Oxford Immunotec)*

**Step 1**
Collect the blood sample in a Cell Preparation Tube and centrifuge to separate Peripheral Blood Mononuclear Cells (PBMCs).

**Step 2**
Wash and count the PBMCs using a microscope and counting chamber or simply run them on a haematology analyser.

**Step 3**
Add PBMCs to wells with antigens and incubate overnight (37°C, CO₂).

**Step 4**
Wash and add secondary antibody.

**Step 5**
Wash and add substrate.

**Step 6**
Count spots:
One spot = one T cell.
Results: Part A

Health Questionnaire/IGRA Test

7059 Total H/Q collected over 2 years

- IGRA +ve: 33
- IGRA -ve: 211
- Complete data: 244
- Total IGRA test: 305
33/244 HCWs IGRA, normal Clinical Examination & CXR = LTBI
No Active TB
Incidence rate LTBI: 13.5%
Age/Sex Distribution Of Study Subjects

F >> M, Majority in age group 16-29

HCWs diagnosed with LTBI tended to be older (mean age of 32 compared to 27 without, p < 0.01).

Gender had no impact on LTBI diagnosis.
**HIC:LIC & IGRA RESULT**

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>IGRA -ve</th>
<th>IGRA +ve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td>81</td>
<td>10</td>
</tr>
<tr>
<td>Asian</td>
<td>72</td>
<td>13</td>
</tr>
<tr>
<td>African/Afrocarib</td>
<td>30</td>
<td>23</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>12.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>138</td>
<td>100%</td>
</tr>
</tbody>
</table>

- HCWs from HIC were 1.4 times more likely to have LTBI, \( p < .05 \)
- 25/33 HIC Vs 8/33 LIC
- HCWs from African ethnic background were 1.9 times more likely to have LTBI, Approaching significance \( (p= 0.070) \)
Students>> Dr>> AHP>> Nurse
Students were 2.9 times less likely to be diagnosed with LTBI (p < 0.01).
CXR & IGRA Test

**Cost Saving** = 121 × £35 = £4,235

**Abnormal CXR** = 5/152, 2 due to old TB and 3 due to other non-TB causes
FINDINGS: PART B

Chest Clinic Referral and Percentage Assessed as LTBI/Normal

Pre-IGRA HQ = 9304, Referred = 39
Post IGRA HQ = 5942, Referred = 52

LTBI = 51% Vs 87%, P < 0.01
Normal = 31% vs. 8% p < 0.01
OR (0.19) CI: (0.06-0.64).
Chemoprophylaxis Uptake and Completion Rate

<table>
<thead>
<tr>
<th></th>
<th>Referred</th>
<th>LTB dx (%)</th>
<th>Started Rx (%)</th>
<th>Completed Rx</th>
</tr>
</thead>
<tbody>
<tr>
<td>TST</td>
<td>39</td>
<td>20/39 (51%)</td>
<td>[VALUE]/20 (60%)</td>
<td>9/12 (75%)</td>
</tr>
<tr>
<td>IGRA</td>
<td>52</td>
<td>45/52 (87%)</td>
<td>33/45 (73%)</td>
<td>31 (94%)</td>
</tr>
</tbody>
</table>

TST  (51%) | IGRA
Summary Of Findings : Part A

Latent TB prevalence rate

• 13.5% (33/244) = (0.45% of the total NHCWs screened in that period)

Active TB - None.

• More cases of positive IGRA, LTBI found in NHCWs from HIC compared to LIC 75% Vs 24%.
• HCWs diagnosed with LTBI tended to be older (mean age of 32 compared to 26.9 without LTBI, p < 0.01) and from HIC (1.4 times more likely to have LTBI, p <.05).
• HCWs from African ethnic background were 1.9 times more likely to have LTBI, which was approaching significance (p=0.070).
• Gender had no impact on latent TB diagnosis.
Summary Of Findings : Part A (cont’d)

• Students were 2.9 times less likely to be diagnosed with latent TB (p < 0.01).

• Abnormal CXR=5/151 (3%), 3 HIC, 2 LIC), 2 due to old TB and 3 due to other non TB related causes
Summary Of Findings: Part B

Comparing referrals to chest clinic pre & post IGRA

• More referrals made to the chest clinic post-IGRA compared to pre-IGRA; 0.9% Vs. 0.4%.

• Increased proportion of HCWs diagnosed with Latent TB post IGRA compared to pre-IGRA; 87% Vs 51%.

• Less cases diagnosed as “Normal” post IGRA 8% Vs 31% p<0.01, OR 0.19, CI 0.06-0.64).

• 1 case of active TB identified.
Summary Of Findings : Part B

Implications for resources:

– Clinician time,
– CXR costs and
– Administrative time before and /or after referral to the chest clinic.

With IGRA test, the percentage of false referrals was much less (7.7%);

• Higher Uptake of Chemoprophylaxis and Chemoprophylaxis completion rates following latent TB diagnosis post-IGRA.

• The single case of active TB identified pre-IGRA started and completed treatment for TB.
Limitations

• Incomplete data

• Difficulty extracting all information from a single source

• Number of HCW screened was small (targeted screening)

• Higher number of students screened who may not have been exposed to TB in healthcare environment
Conclusion

The study result supports:

1. The use of IGRA in screening NHCWs from HRC within the last 5 years
2. The use of CXR in asymptomatic HCWs only after a positive IGRA test.
3. Arrival from a country of high TB prevalence within 5 years is associated with a positive IGRA.
   (Manish et al.: Increasing TB notification in the UK has been attributed to cases in foreign-born immigrants)
4. Years spent in healthcare as a risk factor for a positive IGRA.
The study results support:

1. It is presumed that the single case of active TB identified and those treated for latent TB would have contributed to the prevention of TB transmission to other HCWs or patients.

2. There’s benefit in using IGRA test in a population composed predominantly of BCG vaccinees.

3. With the introduction of IGRA test, more NHCWs are being referred and treated for LTBI by the chest clinic, majority of whom are also being followed up to ensure completion of chemoprophylaxis which is reassuring.
Implications for OH Practice

• Review the need to perform CXR in NHCWs who are IGRA –ve. (Cost saving).

• Implications for resources:
  – Clinician time
  – CXR costs
  – Administrative time before and /or after referral to the chest clinic.

• Cost effectiveness of using IGRA for NHCW screening

• Should we still be screening students?
Any change in Practice

• New OH software procured – EMIS

• Better information input and output

• TB template in place on software

• Improved documentation by OHS staff

• Improved data quality for audit purposes

• Change in procedure for screening (CXR after IGRA test)

• Cost saving for department – clinician time, CXR cost
What are the next steps

Further research

- To determine the ability of IGRA to detect re-infection after treatment for both LTBI and active disease.

- There is a call for further research in people with LTBI to detect if a drug treatment regimen is effective in preventing the development of active TB in comparison with placebo and the most effective regimen.

- Can IGRA test detect latent TB infection in a population composed predominantly of BCG vaccinees.
THANK YOU