Inventory study in Pakistan (Inventory study)

Presented by
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What is Inventory study

- TB Inventory study is the study of under-reporting of TB Cases
- Compares the number of cases recorded in Non NTP public or private health facilities with cases notified.
- Process is through Record linkage can be done by using existing database if good surveillance system exists or preceded by special efforts such as data collection from all non NTP Providers of selected district
Objectives of Inventory Study Pakistan

- To evaluate the extent of under-reporting of TB cases in a representative sample of non NTP facilities in the country.
- To estimate TB Incidence using Capture Recapture Analysis.
- To investigate where are the missing cases in the country.
- To describe the Presumptive TB case management practices of Private Providers.
The study was carried out in all non-NTP facilities delivering care to TB patients in 12 randomly selected districts all over the country.

Inclusion criteria

Physicians and Lab staff delivering care to TB patients in the non-NTP sectors in the selected districts who consented to participate in the study.

The study Preceded by Intensive mapping of all health care providers in selected areas preceded the data collection.
Sources of Data

**Private**
- Private hospitals
- Private teaching hospitals (private universities)
- Private clinics
- Private laboratories

**Public:**
- Public hospitals
- University hospitals (governmental)

**Exclusion criteria**
- Non-consented health workers.
Stratified cluster random sampling was used to obtain a representative sample ie 12 districts, with strata defined by four equal-sized groups (quartiles) according to levels of smear positive notification rates.

The number of selected districts from each stratum was allocated proportionately based on its population size.

One district was obtained from stratum 1, five from stratum 2, three from stratum 3, and three from stratum 4. All the non-NTP facilities in the selected districts were mapped and consenting providers were enrolled.
Intense Mapping of Non-NTP Providers with distribution of modified registers to consenting providers

Data Collection from all health providers

Data entry, data cleaning, data quality Audit

Record Linkage with NTP data Base

Data analysis using log linear modeling (Capture–Recapture)
All non-NTP physicians in the selected district were given a modified suspect register to register every TB suspect and record their case management.

Laboratory registers were introduced in each of the non-NTP labs including information about the full name of the patient, full contact address (with mobile number), age, sex, source of referral, number of specimens examined, results of DSM, final diagnosis, and treating physician.

data collection tools_final.docx
Monitoring

**NPO**

- Engaging concerned DTC for Mapping of non NTP Private health care providers and non NTP Public health facilities
- Monitoring during implementation phase as part of routine monitoring of the district

**DTC**

- To Visit all sources of data every 2 weeks by the DTC in each district
- To cross-check the status of registration at NTP
- To contact all unregistered cases (pos and neg) at NTP registers to verify the diagnosis made by non-NTP.

**Field officers**

- To visit each health facility from each data source
- To coordinate with DTC for cross checking and to contact all unregistered cases.
- To compile and send final data
### Characteristic of the selected districts and smear positive notification rates per 100,000 population.

<table>
<thead>
<tr>
<th>Districts</th>
<th>Population</th>
<th>Smear positive case notification rate</th>
<th>All facilities</th>
<th>NTP facilities</th>
<th>Non-NTP facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rawalpindi</td>
<td>4,235,548</td>
<td>52</td>
<td>1986</td>
<td>25</td>
<td>1961</td>
</tr>
<tr>
<td>Khushab</td>
<td>1,141,196</td>
<td>92</td>
<td>139</td>
<td>13</td>
<td>126</td>
</tr>
<tr>
<td>Lodhran</td>
<td>1,475,118</td>
<td>59</td>
<td>513</td>
<td>9</td>
<td>504</td>
</tr>
<tr>
<td>Rajanpur</td>
<td>1,389,587</td>
<td>70</td>
<td>259</td>
<td>13</td>
<td>246</td>
</tr>
<tr>
<td>Larkana</td>
<td>1,220,718</td>
<td>71</td>
<td>203</td>
<td>9</td>
<td>194</td>
</tr>
<tr>
<td>Mirpurkhas</td>
<td>1,330,017</td>
<td>55</td>
<td>199</td>
<td>13</td>
<td>186</td>
</tr>
<tr>
<td>Swat</td>
<td>1,592,285</td>
<td>57</td>
<td>172</td>
<td>14</td>
<td>158</td>
</tr>
<tr>
<td>Buner</td>
<td>640,898</td>
<td>48</td>
<td>114</td>
<td>7</td>
<td>107</td>
</tr>
<tr>
<td>Battgram</td>
<td>388,991</td>
<td>48</td>
<td>52</td>
<td>5</td>
<td>47</td>
</tr>
<tr>
<td>Zhob</td>
<td>500,896</td>
<td>43</td>
<td>51</td>
<td>6</td>
<td>45</td>
</tr>
<tr>
<td>Lasbella</td>
<td>396,021</td>
<td>62</td>
<td>92</td>
<td>4</td>
<td>88</td>
</tr>
<tr>
<td>Washuk</td>
<td>1,31,871</td>
<td>66</td>
<td>14</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>14,443,146</td>
<td>3794</td>
<td>120</td>
<td>3674</td>
<td></td>
</tr>
</tbody>
</table>
Incident TB cases were defined as:
1) all TB patients registered with the NTP between 1\textsuperscript{st} January 2012 and 31\textsuperscript{st} March 2012.
2) all TB cases confirmed according to NTP criteria during the same time period for cases known to non-NTP providers.
TB Case Definition followed

- Definite case – culture positive for MTB
  - Xpert positive
  - at least one smear positive from quality assured lab
    - Extrapulmonary TB case confirmed on proper evidence
    - smear Negative with Xray suggestive for TB

- Not TB
Data quality assurance

*Intense Monitoring was the Key*

- Engaged facilities were visited weekly by field officers and District Tuberculosis Coordinators (DTCs) to check the records, collect the missing information and verify notification status of the TB cases.

- Non-NTP unregistered cases were contacted to verify diagnosis as per NTP criteria.
Four names were used as a unique identifier when all four names were not recalled by the patient the National ID number was recorded.

The NTP register was examined two quarters before and one quarter after the study period (between July 2011 and June 2012) to check and correct any misclassification of patients not diagnosed during the study period or referred late for notification.
Record linkage was done by using the combination of first, father’s and family name as unique identifiers.

After data cleaning and validation by double data entry of all records, completeness of registration was explored by adding records from all three sources and duplicates were removed.

By cross validation between data sources, data quality was improved.
Capture–Recapture Analysis

- Data from registers were analyzed using capture–recapture methods, which examines the extent of overlap between sources to estimate the total number of unobserved cases.
- In particular, log-linear models were applied to four data registers, and dependencies between sources were accounted for via interaction terms.
Eight standard models (including 3 possible 2-way interactions) and 3 non-standard models (including three way interaction at the expense of one of the 2-way interactions) were applied.

The model with the lowest Akaike Information Criteria (AIC) value was chosen, with lower values indicating better models, which is a standard method for model selection in capture recapture studies.
Estimates of the number of unobserved TB cases (N) in the study area from the 8 standard models (M1–8) and 3 non-standard models (S1–3) that include a three-way interaction.

<table>
<thead>
<tr>
<th>Model</th>
<th>NTP x Lab</th>
<th>Private</th>
<th>NTP x Lab</th>
<th>Private</th>
<th>NTP x Lab</th>
<th>Private</th>
<th>N</th>
<th>95% confidence interval</th>
<th>Detect ed</th>
<th>Notifie d</th>
<th>AIC*</th>
<th>Model weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>10,030</td>
<td>7,800 – 12,910</td>
<td>45.4%</td>
<td>33.0%</td>
<td>78.3</td>
<td>48.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M8</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>18,500</td>
<td>10,890 – 31,420</td>
<td>31.1%</td>
<td>22.6%</td>
<td>78.9</td>
<td>36.4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M6</td>
<td>Y</td>
<td>Y</td>
<td>33,930</td>
<td>30,090 – 38,260</td>
<td>19.7%</td>
<td>14.3%</td>
<td>81.8</td>
<td>8.5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>33,930</td>
<td>30,090 – 38,260</td>
<td>19.7%</td>
<td>14.3%</td>
<td>83.4</td>
<td>3.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M5</td>
<td>Y</td>
<td>Y</td>
<td>10,030</td>
<td>7,800 – 12,910</td>
<td>45.4%</td>
<td>33.0%</td>
<td>84.2</td>
<td>2.6%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>54,680</td>
<td>38,570 – 77,530</td>
<td>13.2%</td>
<td>9.6%</td>
<td>99.2</td>
<td>0.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M7</td>
<td>Y</td>
<td>Y</td>
<td>54,680</td>
<td>38,570 – 77,530</td>
<td>13.2%</td>
<td>9.6%</td>
<td>99.8</td>
<td>0.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M4</td>
<td>Y</td>
<td>37,510</td>
<td>33,410 – 42,110</td>
<td>18.2%</td>
<td>13.2%</td>
<td>103.5</td>
<td>0.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M2</td>
<td>Y</td>
<td>29,670</td>
<td>26,540 – 33,170</td>
<td>22.0%</td>
<td>15.9%</td>
<td>147.9</td>
<td>0.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M3</td>
<td>Y</td>
<td>25,060</td>
<td>20,040 – 31,350</td>
<td>25.0%</td>
<td>18.1%</td>
<td>172.8</td>
<td>0.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M1</td>
<td>32,900</td>
<td>29,540 – 36,640</td>
<td>20.2%</td>
<td>14.7%</td>
<td>177.6</td>
<td>0.0%</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Results:

- Total 8346 TB cases were identified.
- Of them 6061 registered with the NTP.
- The estimated number of unobserved TB cases was 10030 (95% CI 7800–12910).
- Proportion of notified cases was 32% (95% CI 17–49).
- The under-reporting was 27% and the case detection was 45.4%.
- The calculated annual incidence was 497/100000 (95% CI 324–948) Compared to 276/100000 by WHO latest report.
Venn diagram showing study participants (n=8346) by source of identification.
Investigation practices of Private Providers

- Sputum smear only: 19.7%
- Xray only: 24%
- Xray + sputum smear: 39.3%
- Culture: 0.5%
- Other: 16.6%

(Percentage)
Age distribution in the survey compared to the NTP notification data for new smear positive PTB

<table>
<thead>
<tr>
<th>Age Category</th>
<th>Proportion of age categories (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-14</td>
<td>4</td>
</tr>
<tr>
<td>15-24</td>
<td>18</td>
</tr>
<tr>
<td>25-34</td>
<td>22</td>
</tr>
<tr>
<td>35-44</td>
<td>17</td>
</tr>
<tr>
<td>45-54</td>
<td>14</td>
</tr>
<tr>
<td>55-64</td>
<td>11</td>
</tr>
<tr>
<td>65+</td>
<td>8</td>
</tr>
</tbody>
</table>

- **notifications**: 10, 18, 20, 16, 13, 11, 9, 9
- **Survey**: 10, 18, 22, 17, 14, 11, 8, 9

Legend: 
- □ Notifications
- ■ Survey
Gender Wise Distribution of Confirm Cases

- Rawalpindi: Male 51%, Female 49%
- Lodhran: Male 49%, Female 51%
- Rajanpur: Male 49%, Female 51%
- Khushab: Male 45%, Female 55%
- Larkana: Male 35%, Female 65%
- Washuk: Male 49%, Female 52%
- Zhob: Male 41%, Female 59%
- Buner: Male 66%, Female 34%
- Swat: Male 54%, Female 46%
- Batagram: Male 41%, Female 59%
- Lasbela: Male 51%, Female 49%
- Mirpur Khas: Male 59%, Female 41%
Site for referral of TB-suspects by Non-NTP Providers

- District TB Center: 55%
- Public Lab: 15%
- Private Lab: 28%
- Other Providers: 2%
Challenges during implementation

- The data collection from Non NTP Public sector such as military institution was difficult to collect because of high security and confidentiality.
- The collaboration from Private laboratories was suboptimal due to increased workload.
- The Collaboration from general practitioners (GPs) was improved after incentives.
- The GP’s were too busy to fill registers, so most of the time they entered data on small slips and field officer had to enter in registers.
Limited Resource

- C:\Users\Dr. Razia Fatima\Desktop\BALI\presentation\Final Budget 1.xls
Conclusion

- The study estimated a low proportion of cases notified to NTP, with incidence rates higher than official estimates.
- There is a need to strengthen TB Surveillance to reduce under-reporting and urgent need to scale up PPM intervention across the country.
Policy Implications

- The study findings were incorporated in REVISED National Strategic Plan document “Vision 2025”.
- Based on the Evidence generated from Study PPM scale up included in Concept note New Funding Model GF.
Publication

- Presumptive TB Case management by Private providers
Acknowledgement

- We highly acknowledge support from WHO EMRO especially a Tribute to Late Dr Amal Bassilli (RIP) from the proposal writing to actual implementation in field and tremendous support in analysis and manuscript preparation.

- Health Protection Agency for statistical analysis inputs and manuscript preparation.

- University of Bergen to supervise and guide overall process.
Briefing to monitoring mission
Social Security hospital Visit

28/03/2012
Informal Provider (Homeopath)
Field Visit to Clinics
Visit to Fatima Jinnah University Hospital

28/03/2012
Thanks for your attention