DETECTION OF PRIMARY OR EARLY HIV-1 INFECTIONS IN PRETORIA – (preliminary results)

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GLOBAL HIV Prevalence (Population Age 15 – 49, 2009)

Primary HIV infection (PHI)

- is defined as the interval between the time of infection with HIV and that of detectable antibodies (~3 - 12 weeks)

- extremely high levels of infectious virus are detectable in serum and genital secretions and persist for 10 – 12 weeks

- the rate of transmission during PHI is ~26 times as high as that during established HIV infection

- can account for 10%–50% of all new HIV infections, especially in the context of high sexual partner concurrency or high rates of partner change

FIEBIG’S STAGING OF PHI

HIV ASSAYS vs WESTERN BLOT

**STUDY AIM**

- To assess the burden of primary HIV infections in VCT clinics around Pretoria.

**Objectives**

- To use pooled nucleic acid testing (pNAT) to detect the presence of PHI in individuals who test negative on rapid HIV tests.

- To subtype detected PHIs and check their ARV resistance profile.

- To assess if a questionnaire tool that captures HIV risk behaviour can be used to predict PHIs
MATERIALS AND METHODS

Study design and sample size:
• This is a cross-sectional study that will enroll about 4000 participants.

Study duration:
• This study is expected to last for a period of about 2–3 years (i.e. from 2012 – 2014).

Study sites:
• Tshwane district hospital VCT clinic
• FF Ribiero clinic
• Skinner clinic

Study documents:
• Consent form and questionnaire (HIV risk behaviour)
  ✓ Condom use
  ✓ History of unprotected sex
  ✓ Number of sexual partners
  ✓ Drug abuse
  ..and more...
HIV Rapid test

- Negative
  - Pooled NAT (Roche HIV viral load assay)
    - Not detectable
    - Detectable
      - 4th generation HIV ELISA
        - HIV sequencing & ARV resistance testing

- Positive
POOLED NUCLEIC ACID TESTING (pNAT)

200µl plasma from each tube
LOWER DETECTION LIMITS OF HIV MOLECULAR ASSAYS (in plasma) USED IN NHLS LABORATORIES IN 2012

Qualitative HIV PCR (Roche CAP-CTM): 514 copies/mL

Abbott HIV viral load assay (m2000): 40 copies/mL

Roche HIV viral load assay (CAP-CTM v2): 20 copies/mL

2. Roche and Abbot HIV viral loads packages inserts.
PRELIMINARY RESULTS
(March 2012 – mid Sep 2014)

n = 4016

Median age : 27 (IQR: 23 – 32)

Males = 838 (21%)

128 (15%) circumcision

Females = 3178 (79%)

2485 (78%) pregnant

30 (0.8%) tested positive on NAT
INCIDENT HIV INFECTIONS IN STUDY SUBGROUPS

- 30 (0.8%) – overall incidence

  - Circumcision (n - 128) = 0%
  - Non-pregnant group (n - 1531) = 0.7%
  - Pregnant women (n - 2485) = 0.8%
SUMMARY OF POSITIVE PARTICIPANTS (n = 30)

• All participants had **negative HIV rapid tests** at enrolment

<table>
<thead>
<tr>
<th>Pregnant women</th>
<th>Non-pregnant group</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>11 (7 females)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HIV viral load levels</th>
<th>≤10^2</th>
<th>10^3</th>
<th>10^4</th>
<th>10^5</th>
<th>10^6</th>
<th>&gt;10^7</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>3</td>
<td>7</td>
<td>13</td>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

• 4^{th} generation HIV ELISA performed – first 15 participants
  – all tested positive except for one
  – HIV antibody and p24 antigen will be tested separately later
21 participants had follow up rapid HIV test
- all tested positive except for one

TIME INTERVAL TO POSITIVE RAPID TEST

2 – 6 weeks
n = 15

7 - 14 weeks
n = 6*

* = 1 tested negative at 10 week follow up
SEASONS AND PHI INFECTIONS
(March 2012 - Feb 2014)
**FREQUENCY OF CONDOM USE**  \( (n = 4014) \)

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Gender (M - F)</th>
<th>Marital Status Distribution</th>
<th>Incident HIV Infections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never ( (n = 1857, 46%) )</td>
<td>M - 353</td>
<td>S - 818, M - 1028, D - 11</td>
<td>13</td>
</tr>
<tr>
<td>Sometimes ( (n = 1936, 48%) )</td>
<td>M - 371</td>
<td>S - 1690, M - 236, D - 10</td>
<td>17</td>
</tr>
<tr>
<td>Always ( (n = 221, 6%) )</td>
<td>M - 114</td>
<td>S - 195, M - 19, D - 7</td>
<td>0</td>
</tr>
</tbody>
</table>

**Marital status and infections:**

- Single: 23  
- Married: 6  
- Divorced: 1
<table>
<thead>
<tr>
<th>Publications</th>
<th>Country</th>
<th>Acute HIV incidence</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilcher CD, et al. 2005</td>
<td>USA</td>
<td>0.02%</td>
<td>108667</td>
</tr>
<tr>
<td>Shepard CW, et al. 2008</td>
<td>USA</td>
<td>0.08%</td>
<td>21241</td>
</tr>
<tr>
<td>MMWR; CDC.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stekler JD, et al. 2009</td>
<td>USA</td>
<td>0.3%</td>
<td>13677</td>
</tr>
<tr>
<td>CID; 49:444–53.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stevens W, et al. 2005</td>
<td>USA</td>
<td>0.99%</td>
<td>1200</td>
</tr>
<tr>
<td>Abstract MoOa0108, CROI.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gous N, et al. 2010</td>
<td>South Africa</td>
<td>0.13%</td>
<td>3005</td>
</tr>
<tr>
<td>Gay CL, et al. 2010</td>
<td>Malawi</td>
<td>0.21%</td>
<td>2327</td>
</tr>
<tr>
<td>Bassett IV, et al. 2011</td>
<td>South Africa</td>
<td>1.1%</td>
<td>994</td>
</tr>
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</table>
CONCLUSIONS

• Feasibility of incident HIV detection in SA through the use of pNAT
• Other options of detecting these infections are:
  – HIV ELISA
  – Repeat rapid test at 6 weeks later

• A questionnaire tool can be used for prediction of incident HIV infections
• Innovative ideas are needed for promotion of condom use in SA

• Detection of incident HIV infections missed by the rapid tests has a huge potential of reducing HIV spread and prevalence

I’m ~ 95% effective!!!
ACKNOWLEDGEMENTS

- Study participants
  - NHLS Research Trust grant
    - FIDSSA-GSK grant
    - MRC-SIR grant
  - University of Pretoria Research assistant grant
  - Virology department staff – University of Pretoria