Control and Prevention of Sexually Transmitted Infections; *Chlamydia trachomatis*

Dr Nathalie Broutet
Department of Reproductive Health and Research
Since the 80’s: HIV, the new, devastating, STI

... and, since BC, the STIs epidemic
### Levels at which STI have their effects

<table>
<thead>
<tr>
<th>Level</th>
<th>Individual</th>
<th>Sexual partner or unborn child</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acute symptoms</strong></td>
<td>STI transmission</td>
<td><strong>Epidemic</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Infertility</strong></td>
<td>Facilitate HIV transmission</td>
<td><strong>Continuing transmission of STI</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Cervical cancer</strong></td>
<td>Ophthalmia neonatorum</td>
<td><strong>Exacerbation of HIV epidemic</strong></td>
<td></td>
</tr>
<tr>
<td><strong>HIV acquisition</strong></td>
<td>Neonatal pneumonitis</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Neurological and CV disease</strong></td>
<td>Neonatal syphilis</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Recurrent HSV</strong></td>
<td>Neonatal HSV encephalitis</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Counselling</strong></td>
<td>Stillbirth</td>
<td><strong>Primary prevention programme</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Condoms</strong></td>
<td>PRM</td>
<td><strong>Periodic presumptive treatment</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Vaccines</strong></td>
<td></td>
<td><strong>Screening opportunities to be evaluated (targeted services, SRH clinic, STI clinic?)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Male circumcision</strong></td>
<td>Partner notification</td>
<td><strong>Vaccination programme</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Vaginal microbicides</strong></td>
<td>ANC syphilis screening</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Diagnostic tests</strong></td>
<td>Adequate Tx of STI to prevent HIV and STI trans</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Syndromic management</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ATB / antivirals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

STI Global Burden

Global estimated total of STIs, incidence per region 2005

North America 8 561 433
PAHO 89 180 000
EURO 44 600 000
EMRO 25 360 000
AFRO 109 760 000
WPRO 108 600 000
SEARO 70 740 000

Total number of cases
456 801 433
Female 208 970 377
Male 247 831 056
STI Global Burden

Global estimated total of selected STIs, incidence per STI and region 2005

- Chlamydia
- Gonorrhea
- Syphilis
- Trichomoniasis

AFRO AMRO EMRO EURO SEARO WPRO

AFRO AMRO EMRO EURO SEARO WPRO
Transmission of STIs

Breaking the chain of transmission
Transmission Dynamics Model with Intervention Opportunities for the Control of STIs

Transmission dynamics: Sex Workers → Clients → Regular partners

Strategies:
- Targeted interventions
- Enhanced STI prevention & Quality Case Management

Intermediate outcome:
- Increased condom use in commercial sex
- Reduced prevalence of STIs

Ultimate impact:
- Reduced HIV/STI incidence
- Increased condom use in general population
STI Guidance to Expand Coverage

Population with STI → Have symptoms → Asymptomatic STI

Seeking care
- Correct diagnosis
- Correct treatment
- Treatment completed
- Cure

Partner notification, Case finding, Screening

- Promotion of health care seeking behaviour
- Improve quality of care
- Attitudes of personnel
Prevention in General Population

Promoting Healthy Sexual Behavior:

• Correct and Consistent use of male and female condoms
• Delay in onset of sexual activity
• Keeping to one sexual partner or reducing the number of sexual partners
• Abstinence

Communication is crucial:

- Peer educators
- Opinion leaders
- Schools and other arenas

Identify strategies to reach the high-risk population
Primary prevention of infection

• No vaccines available against bacterial infections: progress but no products

• Vaccines available against viral infections:
  – HIV clinical trials…
  – HSV 2 trials…
  – HepB vaccines available
  – HPV vaccines available
STI Guidance to Expand Coverage

Population with STI
Have symptoms
Seeking care
Correct diagnosis
Correct treatment
Treatment completed
Cure

Asymptomatic STI
Partner notification, Case finding, Screening

- Promotion of health care seeking behaviour
- Improve quality of care
- Attitudes of personnel
STIs can be managed through consistently recognized signs and symptoms shown in flowcharts that can be accessed at the primary health clinic level.
Accurate Treatment is Necessary: Prevalence and trends of ciprofloxacin-resistance in *Neisseria gonorrhoeae*

Africa (2001-2009)


Canada (1992-2008)
Asymptomatic STI

Population with STI

Have symptoms

Seeking care

Correct diagnosis

Correct treatment

Treatment completed

Cure

Partner notification, Case finding, Screening
Sexually Transmitted Infections

Most prevalent high-risk sexual behavior populations: Adolescent and Sex workers

Symptomatic Cases

Asymptomatic Cases

Ex.: 70-75% of all Chlamydia cases are asymptomatic!
Estimated New Cases of Genital Chlamydia Infections (WHO, 2005)

Female
Male
Total

Total Number of Cases
101 520 000
Female 54 040 000
Male 47 480 000
Age and Sex-Specific Rate of Chlamydia Infections

**WPRO, 2005-2006**

<table>
<thead>
<tr>
<th>Country</th>
<th>25+ Yrs</th>
<th>&lt;25 Yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiji</td>
<td>23.4</td>
<td>34.0</td>
</tr>
<tr>
<td>Kiribati</td>
<td>8.5</td>
<td>20.0</td>
</tr>
<tr>
<td>Samoa</td>
<td>17.5</td>
<td>40.7</td>
</tr>
<tr>
<td>Solomon Is.</td>
<td>5.7</td>
<td>7.3</td>
</tr>
<tr>
<td>Tonga</td>
<td>8.3</td>
<td>27.5</td>
</tr>
<tr>
<td>Vanuatu</td>
<td>7.3</td>
<td>19.7</td>
</tr>
<tr>
<td>Tuvalu</td>
<td>14.3</td>
<td>20.7</td>
</tr>
<tr>
<td>New Caledonia</td>
<td>11.6</td>
<td>33.7</td>
</tr>
<tr>
<td>Wallis &amp; Futuna</td>
<td>14.9</td>
<td>16.4</td>
</tr>
</tbody>
</table>

**USA, 2006***

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Men Rate (per 100,000 population)</th>
<th>Women Rate (per 100,000 population)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-19</td>
<td>545</td>
<td>86</td>
</tr>
<tr>
<td>20-24</td>
<td>3,158</td>
<td>2,462</td>
</tr>
<tr>
<td>25-29</td>
<td>1,025</td>
<td>1,324</td>
</tr>
<tr>
<td>30-34</td>
<td>669</td>
<td>622</td>
</tr>
<tr>
<td>35-39</td>
<td>76</td>
<td>36</td>
</tr>
<tr>
<td>40-44</td>
<td>54</td>
<td>26</td>
</tr>
<tr>
<td>45-59</td>
<td>24</td>
<td>16</td>
</tr>
</tbody>
</table>

---


Chlamydia trachomatis Infection

Long term consequences

Reproductive tract sequelae:
- PID
- Tubal factor infertility
- Ectopic pregnancy

Control programmes

- Reduce transmission
- Screening asymptomatic prevalent infection in young sexual active women
- Effort to treat male partners
- Screen women for reinfection

number of adverse outcomes of infection
Impact at individual level

Depends on:
- Damage relative to acquisition of infection (tubal)
- Mean duration of infection when screened

Impact at population level

Decrease of the mean duration of infection:
- Reduce nb of complications and transmission
- Decrease nb of new infections

Benefits on tubal damage by detecting infection

Susceptibility to new repeat infections and their risk of sequelae

Potential increase of repeat infections if:
- TTT partners
- Screening for reinfection is low
Recurrence rates are almost as equal as initial rates of infection

Hypothesis:

- Do misperceptions of the risk in relationships exist?
- Is there consistent and correct use of condoms?
- Is the timing of treatment too early in age?
- Are partners being effectively treated?
Inverse Relationship Between Age and **Chlamydia** Infection

**BIOLOGICAL**
- Cervical ectopy (present in adolescents) is linked to higher infection rates
- IFN-γ messenger RNA transcripts are found in older persons (provides immunity)
- Organism load is greater in younger persons

**BEHAVIORAL**
- 18-19 and 20-24 year age groups are peak intervals for having ≥2 sex partners
- Riskier sexual behaviors

Current Responses – Treatment Based on Prevalence Among ANC, Vanuatu

- Treatment based on prevalence (>= 20%)
  - ANC women
  - Issue – partner tx
- CT screening - BD Probe tec
  - Low lab capacity (quality)
  - Limited staff
  - Low coverage
  - Low treatment rate – no drug long turn around time for results
- Drop in centre for vulnerable population

Sex Workers: Targeted Interventions

- Outreach and peer education
- 100% CUP
  - Policy
  - Involvement of brothel/establistment owners
  - Increase condom access
  - Monitoring
- STI services – drop in services
  - Initial presumptive treatment
  - STI syndromic treatment
  - Regular STI check-ups
100% Condom Use Programme – Wuhan China, 2001-03

Chen Zhongdan et al., 2007
Impact of Presumptive Treatment and Condom Use in Philippines, 2001

Findings of study show that interventions are effective. Must **MAINTAIN** ongoing STI screening for **SUSTAINED** STI reductions.

Interventions for ≤25 Population

• Screening and Rescreening of Previously Infected Persons
  Partner treatment

• Health education and Outreach Education
  Access to male and female condoms
  Partner treatment efforts
  Behavioral Modifications

• Access to Services
  “One-stop” shops, multi-purpose youth health centers, age-appropriate school-based services
  Mobile clinics?

• Strengthened Surveillance
  Data stratified by age and sex
Main issue

Sustainability of the interventions to maintain impact

If:
Screening and treatment + Partners treatment

Invest in preventing reinfection

Condom use
Acknowledgments

Research needs:

- POC screening tools
- Infection clearance and persistence
- Pathogenesis
- Protective immunity against infection

Guest Editor: Sami L. Gottlieb

Intern: Melody Maarouf