

## Long-term trends in *Neisseria gonorrhoeae* and *Chlamydia trachomatis* prevalence among brothel-based female sex workers in Denpasar, Bali, Indonesia

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**Abstract:** The objective of this study is to analyze the long-term trends of *Neisseria gonorrhoeae* (NG) and *Chlamydia trachomatis* (CT) infections and risk factors among female sex workers (FSW) in Denpasar, Bali, Indonesia. In order to understand the long-term trends, secondary data was examined from the years 1997-1999, 2004, 2007, 2009 and 2010; to analyze associated factors, data from 2010 was used. Analysis indicates an overall decrease of NG prevalence in Bali from 60.5% (95%CI: 56.6-64.5) in 1997 to 22% (95%CI: 16.8-27.1) in 2010. CT prevalence has also experienced a long term decline but not to the same degree as NG. Findings from analysis of surveys in 2004 and 2010 indicate that there is a strong relationship between condom use in the last sexual transaction with NG infection ( $p=0.02$ ), duration of sex work ( $p=0.02$ ), number of clients in the last week ( $p=0.01$ ), clinic visit intervals and clinic visit frequency. CT prevalence was associated with the number of clients ( $p=0.04$ ) and clinic visit frequency. Unfortunately, these were the only variables collected therefore a multivariate analysis was not possible. High prevalence of both GN and CT is associated with the high mobility of FSW and low condom use. There is a significant long-term decrease of NG prevalence from 60.5% to 22%. However, CT experienced an insignificant long term decrease from 41.3% to 35%.

**Key words:** sexually transmitted infections, female sex workers, Bali, Indonesia

## Tren jangka panjang prevalensi *Neisseria gonorrhoeae* dan *Chlamydia trachomatis* pada pekerja seks perempuan di Denpasar, Bali, Indonesia

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**Abstrak:** Tujuan penelitian ini adalah untuk melakukan analisis kecenderungan jangka panjang prevalensi *Neisseria gonorrhoeae* (NG) dan *Chlamydia trachomatis* (CT) serta faktor risikonya pada pekerja seks perempuan di Denpasar, Bali, Indonesia. Untuk tujuan tersebut, telah dilakukan analisis data sekunder yang dikumpulkan pada kurun waktu 1997-1999, 2004, 2007, 2009 and 2010. Untuk mengetahui faktor risiko terhadap prevalensi NG dan CT dilakukan analisis pada data survei tahun 2010. Hasil analisis menunjukkan adanya penurunan prevalensi NG yang bermakna, yaitu dari 60,5% (95% CI: 56,6-64,5) pada tahun 1997 menjadi 22% (95% CI: 16,8-27,1) pada tahun 2010. Prevalensi *Chlamydia trachomatis* juga terlihat menurun dari 41,3% menjadi 35% tetapi tidak bermakna seperti halnya penurunan prevalensi *Neisseria gonorrhoeae*. Hasil survei tahun 2004 dan 2010 menunjukkan adanya hubungan yang bermakna antara prevalensi NG dengan pemakaian kondom pada hubungan seks terakhir ( $p=0,02$ ), lama bekerja sebagai pekerja seks ( $p=0,02$ ), jumlah pelanggan dalam 1 minggu terakhir ( $p=0,01$ ), serta interval dan frekuensi kunjungan ke klinik. Prevalensi CT dijumpai berhubungan dengan jumlah pelanggan ( $p=0,04$ ) dan frekuensi kunjungan ke klinik. Karena jumlah variabel yang terbatas pada data sekunder yang tersedia, maka tidak dilakukan analisis multivariat. Prevalensi GN dan CT yang masih tetap tinggi yaitu masing-masing 22% dan 35% pada tahun 2010 kemungkinan berkaitan dengan mobilitas pekerja seks dan tingkat pemakaian kondom yang relatif masih rendah.

**Kata kunci:** infeksi menular seksual, pekerja seks perempuan, Bali, Indonesia

## Introduction

The Kerti Praja Foundation (KPF) was established on the 1<sup>st</sup> January, 1992, with the objective of conducting research, providing education and comprehensive health care for local communities in Bali. KPF works directly to address sexual and reproductive health concerns within the general public as well as in most at risk communities, such as FSW, men who have sex with men (MSM) and high risk men (clients of FSW, such as truck drivers, manual laborers, fisherman, and taxi drivers). KPF clinic staff are specialized in sexually transmitted infection (STI) screening and STI treatment as well as in antiretroviral treatment (ART) and in addressing opportunistic infections. As part of a positive prevention program, which aims to increase the self-esteem of People Living with HIV-AIDS (PLWHA) by actively involving them in HIV prevention activities and initiatives, KPF is running peer educator, sharing experience and theatre projects.

Initiated in 1995, KPF outreach education and STI prevention services reach around 3,000 FSWs, mostly around the Denpasar areas. The sex work industry in Bali is illegal and diverse and ranges from direct FSW (the term 'direct FSW' refers to someone whose main source of income is derived from sex work and self-identify as sex workers) working in concentrated brothel-like sites as well as indirect sex workers employed in massage parlors, cafés, karaoke clubs and bars. The majority of FSW originate from other areas in the Indonesian archipelago.

It is estimated that around 8,800 women work in the sex industry in Bali, with 2,900 direct FSW and 5,900 indirect FSW. Indirect FSW differ from direct sex workers in the sense that sex work is a supplementary income generating activity.<sup>1</sup>

STI screening at KPF clinic include syphilis, NG, CT, *trichomonas vaginalis* and *bacterial vaginosis* (BV) testing and treatment. Since 2007 with support from WHO Jakarta, the Ministry of Health (MOH), the National AIDS Commission (NAC) and the Bali Regional Health Department, KPF has been conducting comprehensive periodic presumptive treatment (PPT). In 2007, ciprofloxacin (500 mg) as treatment for NG was replaced with cefixime (400 mg). Doxycycline (100 mg for every 12 hours, for one week) as treatment for CT was replaced with azithromycin (1 g).

STI prevalence and trends within a short time frame in Indonesia have been documented in a number of publications.<sup>2,3,4,5</sup> However, a study recapitulating and analyzing data over a longer period of time is needed, which will also shed light on the impact of the PPT program on NG and CT. This report serves to fill this information gap.

The objective of this paper was to study long term trends in NG and CT prevalence in brothel based sex worker communities from 1997 until 2010. Also, this study seeks to identify factors associated with NG and CT infection, such as consistency in condom use, number of clients, duration of sex work, STI screening intervals and frequency of visits to KPF clinic.

## Method

Data was collated by KPF in collaboration with the University of Michigan (1997-1999), the University of California (2004) and National AIDS Commission (NAC) as part of pre and post surveillance for the PPT program (2009 and 2010). Detailed methodology from previous studies by KPF and the University of Michigan and the University of California has been documented in previous publications.<sup>3,6</sup>

From 1997-1999, a survey of 600 brothel-based, randomly selected FSW was collected and LCx (Abbott Laboratories-discontinued NAAT, nucleic acid amplification test) was used for *polymerase chain reaction* (PCR), which was conducted at University of Michigan. In 2004, another survey of 600 randomly selected FSW (same locations, different sample) in Denpasar was conducted with the University of California. Endocervical swabs were examined at the University of California (AC2, Aptima COMBO 2, Gen-Probe Inc) test for PCR.

In 2009 and 2010, behavioral surveys and endocervical swab samples were collected from 250 randomly selected FSW from the same population, the same location, but different sample, as in the years 1997, 1999 and 2004. Endocervical swabs were collected in the KPF clinic and PCR analysis carried out at the National Institute of Health Research and Development Laboratory, Jakarta using Amplicor CT/NG Amplification (Roche).

In 2009 the National AIDS Commission and KPF began PPT with FSW in a number of cities, including Denpasar. Behavioral surveys in combination with examinations of NG and CT with PCR with the aforementioned 250 FSW. After the study with the University of Michigan was completed, routine STI screening and treatment was continued through the support of HIV Cooperation Program for Indonesia (HCPI), AusAID. In 2004, in collaboration with the University of California, NG and CT prevalence was re-evaluated using PCR analysis of 600 FSW. Results indicated that NG had decreased to 35% (95% CI: 31.1-38.8) yet CT experienced an increase to 45% (95% CI: 41.0-48.9). NG had decreased to 35% (95% CI: 31.1-38.8) yet CT experienced an increase to 45% (95% CI: 41.0-48.9). Data from PCR analysis of samples from 600 FSW was collected in 2004.

During screening and consultation FSW patients were asked whether or not they had visited the clinic before the sample was collected. This information was cross-checked by clinic staff who recorded clinic visit intervals and dates of previous visits.

Biomedical and behavioral surveys were carried out with assistance from the University of Michigan, the University of California, NAC and the Indonesian Ministry of Health (MOH). Methodology was similar in 1997, 1998, 2004, 2009 and 2010; endocervical swabs were collected from a sample of FSWs in Denpasar and PCR analysis was used to detect the presence of NG and CT. Analysis was conducted using SPSS Version 17.0. This project was approved by the Kerti Praja Foundation Institutional Review Board.

## Results

### Long-term trends of NG and CT prevalence

The long-term trends of NG and CT prevalence among FSW in Denpasar are presented in Figure 1. In the year 1997, NG prevalence was 60.5% (95%CI: 56.6-64.5) and the CT prevalence was 41.3% (95%CI: 37.4-45.2). After two years intervention consisting of condom distribution, outreach information sessions, six-monthly STI screening, in 1999, NG prevalence had decreased to 54% (95%CI: 50.0-58.0), however, CT increased slightly to 44% (95%CI: 40.0-47.9).

In 2007, the Indonesian Ministry of Health conducted Integrated Biological and Behavioral Surveillance (IBBS) in a number of cities, including a survey of 250 FSWs in Denpasar wherein NG and CT examination was again carried out using PCR analysis. Results indicated that both NG and CT prevalence had decreased to 29% (95% CI: 23.3-34.6).<sup>7</sup>

The Figure 1 indicates that NG in 2009 (before PPT) was 28% (95%CI: 22.4-33.5) and in

2010 (after PPT) decreased but not significantly to 22%, (95%CI: 16.8-27.1). CT was 25.6% (95%CI: 20.2-31.0) in 2009 but rose to 35% (95%CI: 27.1-38.8) in 2010, potentially owing to resistance of CT to azithromycin and low condom use.

**Association between NG and CT prevalence and behavioral variables**

The relationship between age, duration of sex work, number of clients, condom use and prevalence of NG and CT are presented in Table 1. With regards to duration of sex work, results indicated that FSW working less than a year were more likely to test positive for NG (p=0.02). NG prevalence was higher among FSW who had more than fourteen clients a week (p=0.01). Prevalence of CT was not significantly different with respect to age, duration of sex work and condom use.

**Association between NG and CT prevalence and clinic visit intervals**

The relationship between NG and CT prevalence and clinic visits (STI screening intervals) to KPF are presented in Table 2. First-time visitors to KPF clinic indicated a NG prevalence of 43% (95%CI: 41.0-45.0). Visitors with <15 days interval indicated a NG prevalence of 11.5% (95%CI: 9.0-13.0), this was the lowest prevalence. Visitors with a time interval of 15-30 days showed a NG prevalence of 28% (95%CI: 26.0-30.0). Visitors with an interval of 31-60 days indicated a prevalence of 40% (95%CI: 38.0-42.0) and those with a clinic visit interval of >60 days indicated a NG prevalence of 33% (95%CI: 31-36). Overall, there was a significant difference between NG prevalence and clinic visit intervals. The shorter the interval between visits, the less likely the FSW was to present with NG.

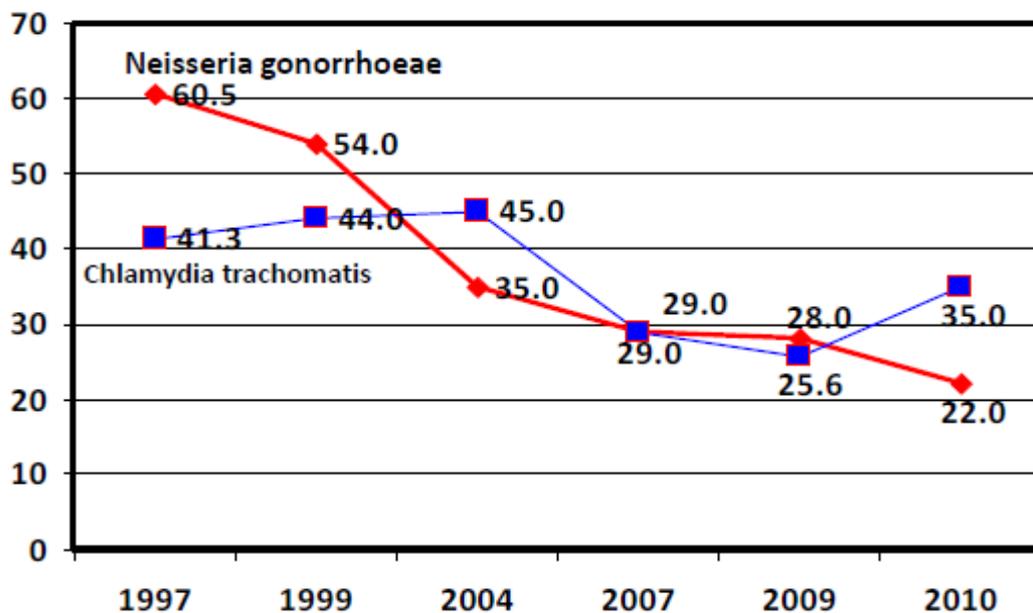


Figure 1. *Neisseria gonorrhoeae* (NG) and *Chlamydia trachomatis* (CT) trends (1997-2010)

**Table 1. Factors associated with *Neisseria gonorrhoeae* and *Chlamydia trachomatis* prevalence (N=249) among FSWs in Denpasar, year 2010**

| Variable                    | % NG positive | p Value | % CT positive | p Value |
|-----------------------------|---------------|---------|---------------|---------|
| Age (years)                 |               |         |               |         |
| 17-25                       | 19.4          | 0.45    | 35.2          | 0.50    |
| 26-45                       | 23.4          |         | 31.2          |         |
| Duration of sex work        |               |         |               |         |
| 1-12 months                 | 26.7          | 0.02    | 34.9          | 0.33    |
| >12 months                  | 14.6          |         | 30.1          |         |
| Number of clients per week  |               |         |               |         |
| 1-14 clients                | 16.1          | 0.01    | 27.7          | 0.04    |
| >14 clients                 | 29.1          |         | 40.0          |         |
| Condom use last transaction |               |         |               |         |
| Yes                         | 18.1          | 0.02    | 31.3          | 0.37    |
| No                          | 31.3          |         | 37.3          |         |
| Condom use last week        |               |         |               |         |
| Always                      | 17.0          | 0.08    | 34.0          | 0.87    |
| Often                       | 22.3          |         | 33.0          |         |
| Rarely                      | 35.5          |         | 29.0          |         |
| Total NG positive           | 54 (21.7)     |         | 82 (32.9)     |         |

In contrast, there was no significant relationship between clinic visit intervals and CT prevalence. First time visitors presented with 50% (95% CI: 48.0-52.0) CT prevalence. Less than 15 day visitors indicated a 38.5% (95% CI: 33.0-43.0) CT prevalence. The 15-30 day interval visitors showed a CT prevalence of 44% (95% CI: 41.0-47.0). Those visiting with an interval of 31-60 days indicated a CT prevalence of 44% (95% CI: 42.0-46.0). Clinic visitors with an interval of >60 days indicated a prevalence of 44.4% (95% CI: 44.0-46.0).

#### **Association between NG and CT prevalence and clinic visit frequency**

The association between NG and CT prevalence and the frequency of clinic visits (STI screening) to KPF are presented in Table 3. Data from PCR analysis of 600 FSW samples collected in 2004 was also used for analysis. As indicated in Table 3, NG prevalence was associated with frequency of clinic visit. The more often they visited the clinic, the lower the prevalence. Those visiting 1 time indicated a 45% (95%CI: 41.2-49.0) NG prevalence. Those visiting 2-5 times showed a NG prevalence of

32.5% (95%CI: 30.0-34.0). FSW visiting from 6-10 times had a NG prevalence of 31% (95%CI: 29.0-33.0); 11-20 times a NG prevalence of 38% (95%CI: 29.0-41.0) and FSW visitors of >20 times a NG prevalence of 25% (95%CI: 23.0-27.0). This association was also noticeable with CT.

Those visiting one time had a CT prevalence 56% (95%CI: 54.0-58.0). FSW visiting 2-5 times showed a CT prevalence of 47% (95%CI: 45.0-49.0) and those 6-10 times a 41% (95%CI: 39.0-43.0) CT prevalence. FSW visiting 11-20 times had a 30% (95%CI: 28.0-32.0) CT prevalence and those visiting >20 times had a 38% (95%CI: 35.0-41.0) CT prevalence.

#### **Conclusion**

Prevalence of NG and CT is high among FSWs in Bali. Findings from an IBBS conducted in 2007 indicated that NG and CT prevalence was also high among FSWs in other parts of Indonesia in North Sumatra was 42.0%, Jakarta 44.2%, West Java 43.9%, Central Java 32.1%

**Table 2. Association between *Neisseria gonorrhoeae* and *Chlamydia trachomatis* prevalence in 2004 and clinic visit intervals among FSWs in Denpasar**

| Interval between STI screening | Number of sample | Percent <i>Neisseria gonorrhoeae</i> positive and 95% CI | <i>Chlamydia trachomatis</i> positive and 95% CI |
|--------------------------------|------------------|--|--|
| First visit                    | 189              | 43.0 (41.0-45.0)   | 50.0 (48.0-52.0)                                 |
| < 15 days                      | 26               | 11.5 (9.0-13.0)  | 38.5 (33.0-43.0)                                 |
| 15 – 30 days                   | 96               | 28.0 (26.0-30.0)   | 44.0 (41.0-47.0)                                 |
| 31 – 60 days                   | 99               | 40.0 (38.0-42.0)   | 44.0 (42.0-46.0)                                 |
| > 60 days                      | 190              | 33.0 (31.0-35.0)   | 44.0 (44.0-46.0)                                 |
| Total                          | 600              | 35.5 (34.0-36.0)   | 45.5 (44.0-46.0)                                 |

**Table 3. Association between *Neisseria gonorrhoeae* and *Chlamydia trachomatis* prevalence in 2004 and clinic visit frequency**

| Clinic visit frequency | Number of sample | Percent <i>Neisseria gonorrhoeae</i> positive and 95% CI | <i>Chlamydia trachomatis</i> positive and 95% CI |
|------------------------|------------------|--|--|
| 1 time                 | 162              | 45.0 (41.2-49.0)   | 56.0 (54.0-58.0)                                 |
| 2 – 5 times            | 194              | 32.5 (30.0-34.0)   | 47.0 (45.0-49.0)                                 |
| 6 – 10 times           | 104              | 31.0 (29.0-33.0)   | 41.0 (39.0-43.0)                                 |
| 11 – 20 times          | 79               | 38.0 (29.0-41.0)   | 30.0 (28.0-32.0)                                 |
| > 20 times             | 61               | 25.0 (23.0-27.0)   | 38.0 (35.0-41.0)                                 |
| Total                  | 600              | 35.5 (34.0-36.0)   | 45.5 (44.0-46.0)                                 |

East Java 15.8% and Papua 32.9%.<sup>8</sup> Other studies conducted in nine provinces indicated similar findings: 43.5% CT prevalence and 28.6% NG prevalence across the board.<sup>4</sup>

Long-term analysis indicates an overall decrease in prevalence rate. NG prevalence in Bali has experienced a decline over time, from 60.5% (1997) to 22.0% (2010). CT prevalence has also experienced an overall, albeit fluctuating, long term decline. This fluctuating decrease in CT is possibly attributed to the high mobility of FSW in combination with low condom use, a high re-infection rate and potential resistance to antibiotics. A recent study documented a very significant decline in NG and CT prevalence in the areas of Salatiga and Bintan.<sup>5</sup> Such a decline in prevalence is possibly attributable to high local government commitment to the 100% condom use program as well as the higher proportion of sex workers covered by the PPT program in those areas.

Consequently, it is difficult to compare such findings with the sex work situation in

in Bali. The nature of the sex work industry plays an important factor in STI and HIV prevalence as the sex work population is far greater in Bali than in the aforementioned areas. Programs in Salatiga and Bintan are supported by the local government; however, this is not the case with Balinese counterparts. Further study into the role of circumcision and greater client intake reportage would shed light more on the situation in Bali.

Findings from the analysis of the survey in Bali, 2010, indicate there is a strong relationship between condom use in the last sexual transaction with NG infection, duration of sex work, number of clients in the last week, clinic visit intervals and clinic visit frequency. However, CT prevalence appears only to be associated with the number of clients and clinic visit frequency. Weaknesses of the study lie in the lack of additional variables, which have made it impossible to conduct a multi-variate analysis.

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