

## Short Communication

# Epidemiology of Sexually Transmitted Infections, HIV, and Related High-Risk Behaviors among Female Sex Workers in Guangxi Autonomous Region, China

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**SUMMARY:** This study assessed the epidemiology of sexually transmitted infections (STIs), HIV, and associated risk factors among female sex workers (FSWs) in Guangxi autonomous region, China. A cross-sectional study of 488 FSWs was conducted using a structured questionnaire to collect sociodemographic and behavioral information. Biological specimens from subjects were sampled to detect various STIs and HIV infection. Among FSWs, the prevalence rates of syphilis, *Neisseria gonorrhoeae*, *Chlamydia trachomatis*, genital herpes, condyloma acuminata, and HIV were 7.2%, 1.8%, 18.2%, 0.4%, 2.3%, and 0.8%, respectively. The prevalence rates of single, double, and triple infections were 22.3%, 3.9%, and 0.2%, respectively. Multivariate analysis indicated that STIs and HIV infection was independently related to low education level (OR = 7.244; 95% CI = 3.031–17.213;  $P < 0.001$ ), low knowledge of STIs/HIV (OR = 0.191; 95% CI = 0.108–0.337;  $P < 0.001$ ), low-grade working place (OR = 1.64; 95% CI = 1.016–2.648;  $P = 0.046$ ), and no condom use during the last sexual intercourse (OR = 0.199; 95% CI = 0.113–0.350;  $P < 0.001$ ). The prevalence of STIs is high among FSWs in Guangxi, is accompanied by a 0.8% HIV-positive rate, and may be largely related to high-risk sexual behaviors. Future interventions should be focused on the reduction of risk factors, including promotion of condom use and improvement of knowledge of STIs and HIV among FSWs.

China is experiencing a rapid spread of human immunodeficiency virus (HIV) epidemics (1,2) in distinct high-risk groups, including former plasma donors (3), injection drug users (IDU) (4), commercial sex workers (5), and men who have sex with men (MSM) (6). The female sex worker (FSW) population is considered a bridge for sexually transmitted infection (STI)/HIV transmission from high-risk populations to the general population through unprotected sexual behavior. However, due to the illegal status of FSWs in China, little is known about STIs and HIV epidemics and the related high-risk factors in this population. In this cross-sectional study, 488 subjects in 4 cities of Guangxi (Liuzhou, Beihai, Chongzuo, and Guigang) were enrolled from May 2007 to October 2007 to investigate the prevalence of STIs and HIV and the associated risk factors in FSWs, and to better evaluate the potential role of FSWs in the spread of STIs/HIV.

FSWs were defined as those who exchanged sex for money in entertainment venues. The places where FSWs

worked were divided into three grades according to the cost of commercial sex behavior: (i) high-grade places (each commercial sex behavior cost more than \$30), including karaoke bars, sauna centers, and drinking bars; (ii) medium-grade places (\$15–30 for each commercial sex behavior), including resort centers and hotels; and (iii) low-grade places (less than \$15 for each commercial sex behavior), including hair/beauty salons and restaurants. The final sample size was 488 FSWs from 4 cities, including 122 FSWs from high-grade places, 242 FSWs from medium-grade places, and 124 FSWs from low-grade places.

The eligible participants underwent an anonymous face-to-face interview using a standardized questionnaire focusing on general demographic information, knowledge of STI, HIV, and other related high-risk behaviors. The awareness rate of knowledge of STIs was defined as the number of people who correctly answered  $\geq 8$  of the 10 questions. After the interview, a free gynecological examination was conducted by a female gynecologist. Tissue fluid, cervical swabs, and a 5-mL blood sample were collected to test for infections. This study was approved by Ethics Committee of the local Dermatology Institute of Guangxi, and written informed consent was obtained from all subjects prior to the interview and sample collection.

Tissue fluid from subjects with clinical symptoms of

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condyloma acuminata caused by human papillomavirus (HPV) and genital herpes caused by herpes simplex virus (HSV) were sampled for testing using a PCR kit (Daan Biotechnical Co., Guangzhou, China). Cervical swabs were collected for *Neisseria gonorrhoeae* and *Chlamydia trachomatis* testing. Thayer-Martin selective culture media (Yingke Biotechnical Co., Zhuhai, China) was used to culture *N. gonorrhoeae*, and typical colonies of oxidase positive, Gram-negative diplococci that grew on the Thayer-Martin culture media and were positive for glucose fermentation were confirmed as *N. gonorrhoeae*. *C. trachomatis* was diagnosed by an EIA test (Micro Trak II CT EIA; Trinity Biotech, Co Wicklow, Ireland). The blood sample was used to detect syphilitic infection using a nontreponemal test, the toluidine red unheated serum test (TRUST; Shanghai Rongsheng Biotech, Shanghai, China), and positive samples were confirmed by *Treponema pallidum* particle agglutination (TPPA; Serodia; Fujirebio, Inc., Tokyo, Japan). HIV antibody was detected by an ELISA (Gibial Biotechnical Co., Beijing, China). If the result was positive, two additional assays (the original assay plus a different, confirmatory assay) were conducted in parallel. If both tests were positive or the results were discordant, the specimen was sent to the HIV Confirmatory Center at the CDC in Guangxi for a blot assay (HIV blot 2.2; Genelabs Diagnostics, Singapore).

Questionnaire and biological data were entered twice and validated using EpiData software (version 3.1; EpiData Association, Odense, Denmark). Univariate and multivariate analyses were performed using SPSS 13.0 software. The Pearson  $\chi^2$  test was used for bivariate comparison of categorical data. A *P* value of  $<0.05$  was considered statistically significant. Univariate analysis was performed to assess the relationship between variables (potential risk factors) and established STIs and HIV infection. Only variables that were significant at  $P < 0.05$  were used to select significant variables.

The 488 subjects had a mean age of 24.6 years (range, 16–48 years). Close to one-fourth of the FSWs (28%) had a primary school education; 261 (53.5%) received a junior high school education; 17% had a higher or secondary school education; 1.2% had completed college or higher education; and a small minority of FSWs (4.3%) never attended school. More than half of the women (66.2%) were unmarried, 32.2% were married, and 1.6% stated that they were divorced, separated, or widowed. While only 22.7% of the subjects were local residents, 46.5% of FSWs were from other cities in Guangxi province, and 30.8% were from other provinces such as Yunnan, Hunan, Hubei, and Sichuan. More than half of the subjects (59.4%) were of Han ethnicity (Table 1).

Among the FSWs, the HIV prevalence was 0.8% (OR = 2.008; 95% CI = 0.366–11.016). The results showed that 27.7% were positive for at least 1 of the 6 pathogens detected, *C. trachomatis* infection was the most predominant at 18.2%, and the prevalence rates of syphilis, HPV, *N. gonorrhoeae*, and HSV were 7.2%, 2.3%, 1.8%, and 0.4%, respectively (Table 2). Among the 488 FSWs, 26.4% (129/488 with 135 positive pathogen test) were infected, 22.3% had 1 kind of infection (STI or HIV). Double infections were observed in 3.9%

Table 1. Sociodemographic characteristics of 488 female sex workers (FSWs)

Characteristic	FSW ( <i>n</i> = 488)	
	No.	(%)
Age (y)		
< 20	65	(13.3)
20–25	208	(42.6)
26–29	119	(24.4)
> 30	96	(19.7)
Education		
Illiteracy to primary school (0–6 y)	138	(28.3)
Junior high school (7–9 y)	261	(53.5)
High school (10–12 y)	83	(17.0)
Higher (> 12 y)	6	(1.2)
Marital status		
Married	157	(32.2)
Never married	323	(66.2)
Other	8	(1.6)
Native place		
Local	111	(22.7)
Other place in Guangxi	227	(46.5)
Outside Guangxi	150	(30.8)
Ethnicity		
Han	290	(59.4)
Others	198	(40.6)
Place		
High	122	(25.0)
Moderate	242	(49.6)
Low	124	(25.4)

Table 2. Prevalences of STIs/HIV among FSWs in Guangxi

Pathogen	Total	Positive No. (%)	OR (95% CI)	<i>P</i>
HPV	488	11 (2.25)	5.60 (1.24–25.46)	0.011
HSV	488	2 (0.41)	Reference	
Syphilis	488	35 (7.17)	18.76 (4.49–78.51)	<0.001
NG	488	9 (1.84)	4.57 (0.98–21.24)	0.032
CT	488	89 (18.24)	54.20 (13.27–221.49)	<0.001
HIV	488	4 (0.82)	2.01 (0.37–11.02)	0.343

STIs, sexually transmitted infections; HPV, human papillomavirus; HSV: herpes simplex virus; NG: *Neisseria gonorrhoeae*; CT: *Chlamydia trachomatis*; HIV: human immunodeficiency virus; OR, odds ratio; CI, confidence intervals.

and 0.2% had triple infections. Multiple infections (STIs/HIV) were observed in 4.1% of the FSW population.

It was more common for FSWs with low education to be infected with STIs: 94 (36.02%) of the FSWs with a junior high school education had STIs, which was the highest prevalence rate among all education levels (Table 3).

The prevalence of STIs and HIV in FSWs according to working place grade was analyzed and is shown in Tables 4 and 5. FSWs working in low-grade places had the highest prevalence of STIs/HIV compared to those who worked in medium- or high-grade places. The FSWs in working in high-grade places had the highest STI/HIV awareness rate of 68%, while FSWs in low-grade places had a rate of 24%. Nearly half of the FSWs

Table 3. Multivariate analysis of STIs and HIV infection and related factors among FSWs in education levels

	Total	No. (%)	OR (95% CI)	P
Awareness of STIs/HIV				
Illiteracy to primary school	138	5 (3.62)	Reference	
Junior high school	261	117 (44.83)	18.20 (7.19–46.06)	<0.001
High school	83	36 (43.37)	17.16 (6.34–46.43)	<0.001
Higher	6	3 (50)	11.20 (2.15–58.33)	0.012
Prevalence of STIs/HIV				
Illiteracy to primary school	138	28 (20.28)	2.97 (1.15–7.70)	0.009
Junior high school	261	94 (36.02)	7.24 (3.03–17.21)	<0.001
High school	83	6 (7.23)	Reference	
Higher	6	1 (16.67)	2.27 (0.26–25.66)	0.397

Abbreviations are in Table 2.

Table 4. Multivariate analysis of STIs and HIV infection and related factors among FSWs in working places

	Total	No. (%)	OR (95% CI)	P
Awareness of STIs/HIV				
High	122	68 (55.74)	0.19 (0.11–0.34)	<0.001
Moderate	242	69 (28.51)	0.60 (0.36–1.02)	0.058
Low	124	24 (19.35)	Reference	
Prevalence of STIs/HIV				
High	122	32 (26.23)	0.85 (0.51–1.40)	0.519
Moderate	242	56 (23.14)	Reference	
Low	124	41 (33.06)	1.64 (1.02–2.65)	0.046
Proper medical treated				
High	122	118 (96.72)	0.17 (0.06–0.50)	<0.001
Moderate	242	230 (95.04)	0.26 (0.12–0.54)	<0.001
Low	124	103 (83.06)	Reference	
Condom use in the last sexual act				
High	122	96 (78.69)	0.20 (0.11–0.35)	<0.001
Moderate	242	148 (61.16)	0.49 (0.32–0.76)	0.002
Low	124	54 (43.55)	Reference	

Abbreviations are in Table 2.

Table 5. Prevalence of HIV in different groups

	No.	Positive	P
Prevalence of HIV in different education group			
Illiteracy to primary school	138	2	0.686
Junior high school	261	1	
High school	83	1	
Higher	6	0	
Prevalence of HIV in different working place			
High	122	0	0.003
Moderate	242	0	
Low	124	4	

with a high school education (43.37%) had knowledge of STIs/HIV, had the lowest prevalence of infection (7.23%), and most of them (96.72%) sought proper medical treatment when faced with an infection (Tables 3, 4, and 6). Most of the FSWs in high-grade places (78.69%) used a condom during their last sex behavior, compared to only 43.55% of the FSWs working in low-grade places ( $P < 0.001$ ) (Table 4).

Having no knowledge of STIs/HIV was the major

Table 6. Statistical analysis of answers to the questions related to STIs knowledge

Question	No. (%)
Know four or more STIs	165 (33.8)
Are all kinds of lesions in genitals STIs?	241 (49.4)
Can reduction of sexual partners reduce the risk of STIs?	266 (54.5)
Can use of condoms reduce the risk of STIs?	409 (83.8)
Are STIs patients more susceptible to be infected by HIV?	288 (59.0)
Can syphilis transfer from pregnant women to their fetus?	315 (64.5)
Will people who infected STIs be re-infected?	345 (70.7)
Do partners (including the boy friend) of patients with STIs need to be examined or treated?	353 (72.3)
Can vaginal washing prevent STIs	279 (57.2)
Can people be infected by having dinner with STIs patients?	386 (79.1)

risk factor for STIs/HIV among the FSWs. Risk factors for STIs/HIV among the FSWs included the grade of the working places (OR = 1.641; 95% CI = 1.016–2.648) and the level of education (OR = 7.244; 95% CI = 3.031–17.213). The rates of awareness and condom use in FSWs were related to the difference in infection prevalence among the different working places for FSWs (Table 4).

Our study found that the prevalence rate of syphilis, *N. gonorrhoeae*, *C. trachomatis*, HSV, and HPV were 7.2%, 1.8%, 18.2%, 0.4%, and 2.3%, respectively. In contrast, the prevalence rates of syphilis and *N. gonorrhoeae* are 76.64/100,000 and 15.12/100,000 in the general population of Guangxi. The prevalence of STIs in the FSWs in Guangxi were also higher than that of general female populations, such as female marker vendors in Fuzhou, Guangdong, where the prevalence rates of *C. trachomatis*, syphilis, and *N. gonorrhoeae* are 11.2%, 1.31%, and 1.36%, respectively (7). Considering that other STIs, such as bacterial vaginosis or *Trichomonas vaginalis* were not detected because of inadequate specimens, these STI infections may be even more prevalent among FSWs in Guangxi.

Our results show that infection with *C. trachomatis* and *N. gonorrhoeae* are the most common in a considerable proportion of the FSWs who had mixed infections. The one FSW with a triple infection was infected with *N. gonorrhoeae*, *C. trachomatis*, and HIV. These observations could be used to advise treatment where the

technical capacity to diagnose is not available or is lacking.

The majority of the present study participants were less than 25 years old, unmarried, with an education lower than junior high school. FSWs with poor knowledge of STIs/HIV had more risky sexual behaviors and a higher prevalence of STIs/HIV. Baltazar et al. (8) reported that illiteracy among FSWs was associated with acquiring a STI and/or reproductive system infection. A higher prevalence of STIs/HIV was observed in the FSW population with the following characteristics: less knowledge of STIs, infrequent condom use, and working in a low-grade setting. FSWs in low-grade work places lack the necessary knowledge of STIs/HIV; only 33.8% of these subjects could name more than four kinds of STIs, approximately 30% thought STIs cannot infect a person who was infected before, which may lead to more risky sexual behavior. Strengthening health education and intervention among FSWs is critical for the prevention and control of STI/HIV epidemics.

Previously, the main cause of the HIV epidemic in China was injection drug use and needle sharing; however, sexually transmitted cases are rapidly increasing (9). Among the 50,000 new HIV infections acquired during 2007, heterosexual transmission accounted for 44.7% (10). FSWs are considered a significant contributor to the heterosexual transmission of HIV. Our study found that 0.8% of the FSWs were HIV positive, and this prevalence rate was similar to that from studies in Sichuan (0.6%) (11) and Henan (0.6%) (12), which also have serious HIV epidemics, but was much higher compared to other areas of China, such like Zhangjiajie (0.22%) (13) and Chongqing (<0.5%) (14). In our study, none of the FSWs were found to be IDUs, but a few FSWs reported the drug use of their sex partners. Considering that not every client honestly reports drug use, the number of actual IDUs could be higher than what has been reported. This study provides evidence of the need for interventions to reduce high-risk sexual behavior and improve the provision of medical treatment when faced with a STI or HIV infection. Effective interventions, such as a 100% condom use promotion program, enhancing the knowledge of STIs/HIV, and standardization of STIs/HIV diagnostics and treatment, could be enforced among this special group, the FSWs. Related correlations identified in the present study could help facilitate the above-mentioned measures.

Although the findings of our study could be applied to similar sociodemographic and economic populations, the need for intervention using population-specific data is also emphasized.

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**Conflict of interest** None to declare.

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