



Received: 23 June 2017
Accepted: 02 January 2019
First Published: 07 January 2019

*Corresponding author: Enrique Teran, Colegio de Ciencias de la Salud, Universidad San Francisco de Quito, Ecuador
E-mail: eteran@usfq.edu.ec

Reviewing editor:
Udo Schumacher, University Medical Center Hamburg-Eppendorf, Germany

Additional information is available at the end of the article

EPIDEMIOLOGY | RESEARCH ARTICLE

Risk factors for HIV and STI among female sex workers in a high HIV prevalent region of Ecuador

Isabel Hernandez^{1,2}, Miguel Reina-Ortiz^{3,4}, Korede K. Yusuf³, Tatiana Ochoa^{3,5}, Carlos Rosas², Vinita Sharma², Eknath Naik³, Hamisu M. Salihu⁶, Santiago Terán², Ricardo Izurieta² and Enrique Teran^{2*}

Abstract: Background: Globally, female sex workers (FSWs) constitute one of the most vulnerable populations for HIV/STI acquisition. However, very little is known about these infections and their risk factors among FSWs in Ecuador and Latin America.

Objectives: To assess the level of knowledge, risk behaviors and factors associated with the prevalence of HIV, syphilis and self-reported STI among FSWs in a high HIV prevalence province in Ecuador.

Methods: Data from 270 FSWs in Ecuador recruited by snowball sampling were analyzed. Structured questionnaires were administered through face-to-face interviews and blood samples were obtained and tested for HIV and syphilis.

Results: The prevalence were 0.7% for HIV infection, 3.3% for syphilis and 26.4% for other self-reported STIs. Age of onset of sex work, knowledge of HIV transmission and condom use were significant risk factors for HIV/syphilis co-infection. The factors associated with self-reported STI were the age of onset of sex work, knowledge of any STI, marital status, and sex with other person(s) other than clients.

Conclusions: In a high HIV prevalent region of Ecuador, among FSWs the prevalence of HIV and syphilis was low but self-reported STIs was high, and this study identified several risk factors that provide scientific evidences for health policy decisions like the strength of health promotion and education programs for FSWs, especially the among the youngest.

ABOUT THE AUTHOR



Enrique Teran

Enrique Teran, MD, PhD is Professor at School of Medicine in the Universidad San Francisco de Quito (USFQ) in Quito, Ecuador. Dr. Teran is leading a multidisciplinary and multinational team that has been working for several years now on different aspects related to HIV/AIDS in Ecuador, both from the laboratory to the epidemiological points of view. This report is one of the results of a very comprehensive study on one of the poorest areas of Ecuador with the highest prevalence of this disease and shows the urgent need for educational interventions and collaborative work as Dr. Teran's team is performing.

PUBLIC INTEREST STATEMENT

Female sex workers (FSWs) constitute one of the most vulnerable populations for HIV/STI (sexual transmitted infections) acquisition. This study assesses the level of knowledge, risk behaviors and factors associated with the prevalence of HIV, syphilis in a high HIV prevalence province in Ecuador. Data from 270 FSWs through face-to-face interviews was obtained. The prevalence was 0.7% for HIV infection, 3.3% for syphilis and 26.4% for other self-reported STIs. Age of onset of sex work, knowledge of HIV transmission and condom use were significant risk factors. This study identified several risk factors that provide scientific evidence for health policy decisions like the strength of health promotion and education programs for FSWs, especially among the youngest.

Subjects: AIDS & HIV Infection; Sexually Transmitted Diseases; Sexual & Reproductive Health

Keywords: female sex workers; HIV; syphilis; ITS; Ecuador

1. Introduction

Female sex workers (FSWs) constitute one of the most vulnerable populations for HIV or sexually transmitted infection (STI) acquisition, and in some countries, none from Latin America, constitutes 13 times higher odds of HIV infection than other women of similar reproductive age (Baral, Beyrer, & Muessig et al., 2012). In Latin America, FSWs are one of the key populations for HIV and STI transmission (De Boni, Veloso, & Grinsztejn, 2014) and this is partly due to the high prevalence (2.5–6.5%) of men who visit sex workers (Carael, Slaymaker, Lyster, & Sarkar, 2006). Clients of FSWs have sex with members of both high risk (FSWs) and low-risk female populations (wives and regular partners) (Morris, Podhisita, Wawer, & Handcock, 1996). As a result, HIV/STI transmission networks are formed between populations at higher and those at lower risk, allowing for transmission of HIV and other STIs across them. This interaction has led to increasing HIV prevalence among low-risk populations (Morris et al., 1996). Given the central role of FSWs in the epidemiology of HIV and other STI in Latin America, it is important to study their current knowledge about condom use and other behaviors and characteristics that influence the acquisition of HIV and STIs.

In Ecuador, a country where sex work is legal, the prevalence of HIV among female sex workers was estimated to be between 0.5% and 2.1% in the cities of Quito and Guayaquil, respectively (Montano, Sanchez, & Laguna-Torres et al., 2005). Very few HIV/AIDS research studies have been conducted in this population and the actual magnitude of the disease and associated risks are not known (MSP, 2010). The first case of HIV/AIDS in Ecuador was reported in 1984 by the Ministry of Public Health of Ecuador (MPHE), and the number of people living with HIV/AIDS (PLHIV) has been increasing ever since, reaching 37,000 among adults 15 years and older in 2013 (MSP, 2011). In approximately 99% of the cases reported in Ecuador, HIV is sexually transmitted (CARE, 2008). While current data suggests that the HIV epidemic in Ecuador is concentrated amongst men who have sex with men (MSM), there is very little information about HIV among FSWs. Understanding the factors associated with HIV/STI among the latter group will aid in strengthening prevention programs to promote safer sex practices among FSWs and their clients, especially in regions with high reported HIV prevalence.

Syphilis, which is also a sexually transmitted disease, is an important public health problem resulting in serious consequences for health if left untreated. It is one of the ulcerative diseases that increase the risk of acquisition and transmission of HIV (Chen et al., 2015). Syphilis is not homogeneously distributed among the population as FSWs are disproportionately affected (Li, Li, & Liu et al., 2014; Tao et al., 2014; Zoni, González, & Sjögren, 2013). A recent systematic review in Latin America found the prevalence of active syphilis to be 5% with a large variation among and within countries ranging from 0% to 18.8% among female sex workers (Zoni et al., 2013). The same study by Zoni and colleagues (Zoni et al., 2013) on syphilis in the most at-risk populations in Latin America identified gaps in the availability of studies on syphilis in Ecuador.

The aim of this study is to determine the prevalence of HIV and syphilis infections, as well as the risk factors associated with them, including level of knowledge about HIV/STIs, and condom use, among FSWs in a high HIV prevalence province in Ecuador.

2. Methods

2.1. Study design and eligibility

A cross-sectional study was conducted between February and March 2010 in a province with high HIV prevalence in the northwest region of Ecuador. Using an estimated FSW population of 680 in that province, HIV prevalence of 3.7% among FSW in Ecuador (UNGASS, 2008) and a standard error

of 1.25%, a sample size of 216 was calculated to be required for the study. In order to account for a refusal rate of up to 20%, a target sample size of 270 was estimated and recruited. Women, 18 years of age or older, who reported during the last six months selling sex for money occasionally or full-time within the province, who were able to understand the concept of informed consent and provide informed consent were eligible for the survey. Women who were intoxicated at the time of the survey or for any other reason unable to understand or provide informed consent were excluded from participating. An anonymous structured questionnaire was administered face-to-face to all participants. The questionnaire consisted of four parts: demographic information, HIV-related knowledge, and sexual and HIV risk behaviors.

Participants were also asked to voluntarily provide blood specimens that were tested for HIV and syphilis. This study protocol was submitted for review and approved by the ethics committee of a registered institutional review board in Ecuador (blind), and the United States (blind).

2.2. Sampling method

Ecuador is a country located in the northwest region of South America with a per capita income of US\$6,290.80 (World Bank, 2015). Its surface area is approximately 245,000 km² and its population is more than 14 million (Instituto Nacional de Estadísticas y Censos, 2013). This study was conducted in the northwest region of Ecuador which holds a disproportionate burden of the HIV/AIDS epidemic in the country (0.05% vs. 0.03%) (MSP, 2011).

Even though sex work among females is legal in Ecuador, it is difficult to conduct a probability sample-based survey designed to provide representative estimates of biologic factors and behavioral practices among FSWs.

Potential study participants were recruited through snowballing sampling technique. This technique was chosen in order to enroll hard-to-reach populations (Hernandez et al., 2017). Two categories of FSWs were targeted: FSWs officially registered with the Provincial Health Department, and the unregistered FSWs (they do not see themselves as sex workers but seek clients in bars, parks, on the beach, etc. or have to be contacted through a procurer). In order to achieve a sample that is representative of these two categories of FSWs, individuals called “seeds”, were chosen arbitrarily to start the process. We expected to be able to contact many other eligible individuals from across the categories using this technique. Health promoters, working closely with the sex worker association and peer educators, were selected from different parts of the province to identify the first set of study participants (seeds). Six “seeds” were the first to be invited to participate in the study. After completing their participation, they became temporary recruiters and were given three vouchers each. Vouchers were used to recruit eligible peers in the survey. Each peer was referred to the study site with a voucher that had a unique serial number. Once a peer returned the voucher to the study site, the seed recruiter was eligible for a small incentive in recognition of the recruitment effort. Each newly referred and enrolled respondent in turn received three vouchers for recruitment. Data collection continued through successive recruitment waves until the desired sample size of 270 was attained.

2.3. Laboratory procedure

Sera for HIV-1 were tested in batches with a Vironostika Ab Elisa test kit. The results were reported to the MoH, and they followed up persons who tested positive for HIV as per their protocol. Syphilis testing was performed using the VDRL Syphilis TM test manufactured by Wama Produtos para Laboratório Ltda, in Brazil.

2.4. Measures

2.4.1. Primary outcomes

The main outcomes of interest were: HIV/Syphilis infection, self-reported STI and condom use. HIV/Syphilis infection was defined based on the results of the laboratory procedures stated above. This outcome was dichotomized as yes or no. FSWs who tested positive to either HIV or syphilis were

defined as having HIV/syphilis infection. Self-reported STI was defined as self-report of having a sexually transmitted disease within 3 months prior to the survey being administered. This outcome was also dichotomized as yes/no. The third outcome, condom use, was defined as self-report of consistent condom use with clients. This variable was classified as yes (participants always use a condom with clients) and no (participants reporting the use of condom as almost always/sometimes/never use a condom with clients).

2.4.2. Independent/predictive variables

These include socio-demographic factors as well as HIV-related knowledge and behaviors. Socio-demographic factors were collected from participants and included: age in years (categorized as <20 years, 20–35, and >35 years), age at onset of sex work (<18 years, ≥18 years) educational status (less than secondary school, secondary and higher), marital status (married/cohabiting, single/previously married), have stable partner (yes, no), have children (yes, no), and residential time in the city (<1 year, ≥1 year).

Behavioral factors: included first sex work experience (voluntary, forced), type of sex worker (registered, unregistered), having sex with the person(s) other than the client (yes, no) and routine gynecological check-up (yes, no).

HIV/STI related knowledge: knowledge of HIV transmission was evaluated by 10 questions, to which participants needed to answer yes or no. The outcome was operationalized through dichotomization of the total number of right answers, with low knowledge defined as less than 8 right answers. Knowledge of any infection transmitted by sex was dichotomized as yes (participant knows at least one STI) or no (participant does not know any STI).

2.5. Data management and analysis

All interview and laboratory results data were entered in duplicates into an EPI-INFO 6.0 database. De-identified data were exported into SAS 9.3 for data cleaning and analysis. Differences between FSWs based on the 3 outcomes of interest (consistent condom use, self-reported STI in the 3 months prior to the survey being administered and HIV/Syphilis) were assessed by bivariate analysis. Chi-squared tests were used for categorical variables, and Fisher exact tests were used for contingency tables when more than 20% of the cells had expected counts less than five. The independent sample t-test was used for continuous variables. Independent risk factors for the outcomes were assessed using logistic regression analysis. Variables significant in the bivariate analysis were included in a multivariate model. Potential socio-demographic confounders such as age, educational status, and marital status were included in the multivariate analysis and adjusted odds ratios were generated. All testing was two-sided, and $p \leq 0.05$ was considered statistically significant.

3. Results

The study sample (N = 270) comprised FSWs with a mean age of 27.7 years (range 18–54). Table I shows the socio-demographic characteristics of FSWs in the study population.

Overall, the HIV prevalence among FSWs in this study was 0.7% (n = 2) while the prevalence of syphilis was 3.3% (n = 9). Over a quarter 26.4% (n = 71) of participants reported having STI in the 3 months preceding the survey. Most FSWs (91.8%) reported consistent condom use with clients.

Approximately 80% of participants reported knowing of an infection that can be transmitted by sex and 94.1% (n = 254) reported knowing how HIV is transmitted). Only about one-tenth (n = 25) of the FSWs were able to correctly identify all 10 modes of HIV transmission that were asked (Table 2). Regarding HIV risk and treatments, the median number of questions on HIV risk and treatment correctly answered was 3 out of 4. With regards to the behaviors of FSWs in Ecuador, 12.2% started selling sex when they were younger than 18 years of age and the range for age at onset of sex work was 12–38 years.

Table 1. Socio-demographic characteristics of female sex workers participating in the risk factors for HIV and STI study in a high HIV prevalence province in Ecuador (N = 270)

Characteristics	n (%)
Current age (years)	
18–24	99 (36.7)
25–35	133 (49.3)
>35	38 (14.1)
Marital status	
Single/previously married	165 (61.1)
Married/cohabiting	105 (38.9)
Educational Level	
Less than secondary	205 (75.9)
Secondary or higher	58 (21.5)
Missing	7 (2.6)
Have stable Partner	
Yes	120 (44.4)
No	146 (54.1)
Missing	4 (1.5)
First sex work experience	
Voluntary	233 (86.3)
Forced	20 (7.4)
No response	17 (6.3)
Type of sex workers	
Registered	193 (71.5)
Unregistered	77 (28.5)
Duration of residence in city	
Less than 1 year	208 (76.7)
At least 1 year	62 (23.3)

Table 3 shows that FSWs who tested positive for HIV/syphilis were more likely to be in the 20–35 age group, to have started selling sex before the age of 18 years, to have less than a high school education and to be single/previously married. Among these variables, only age at onset of sex work was significantly different by HIV/Syphilis status ($p < 0.001$). Participants who reported having started sex work younger than 18 years old had higher prevalence rates of HIV/Syphilis infection. Participants who reported having an STI within the 3 months prior to survey administration were also more likely to have started selling sex before the age of 18, and be currently under the age of 20 years, to have less than a high school education and to be single/previously married. Similarly, only age at onset of sex work was significant ($p < 0.05$) as a predictor for reporting an STI within the 3 months prior to survey administration. The prevalence of consistent condom use also varied by age, age at onset of sex work, education and marital status. Participants who least reported consistent condom use were more likely to be older than 35 years ($p < 0.05$), and to have started selling sex before 18 years of age ($p < 0.0001$). Furthermore, they were more likely to have been forced into selling sex and to have lived in the city for at least 1 year (<0.0001).

There were no associations observed between HIV/Syphilis infection and socio-demographic factors: age, marital status, educational status, stable partner and duration of living in the city in the unadjusted analysis. In the adjusted model, the relationship between HIV/Syphilis infection and the following variables were found to be significant: age of onset of sex work, knowledge of HIV transmission and condom use. Compared to FSWs who started selling sex before the age of

Table 2. HIV/STI related knowledge and behaviors among female sex workers in a HIV prevalence province in Ecuador (N = 270)

Variable	n (%)
Knowledge of HIV transmission (Do you think HIV can be transmitted) ^a	
Having vaginal or anal sex without using protection?	
Yes	251 (98.8)
No	1 (0.4)
Don't Know/No Response	2 (0.8)
Using the same bathroom as a person who is infected?	
Yes	73 (28.7)
No	172 (67.7)
Don't Know/No Response	9 (3.5)
Sharing needles when using intravenous drugs?	
Yes	238 (93.7)
No	11 (4.3)
Don't Know/No Response	5 (1.9)
Receiving a blood transfusion	
Yes	234 (92.1)
No	15 (5.9)
Don't Know/No Response	5 (2.0)
Using the same cutlery as a person who is infected?	
Yes	39 (15.3)
No	200 (78.7)
Don't Know/No Response	15 (6.0)
Using the same razor blade as a person who is infected?	
Yes	174 (68.5)
No	60 (23.6)
Don't Know/No Response	20 (7.9)
Being in contact with the sweat of a person who is infected?	
Yes	31 (12.2)
No	196 (77.2)
Don't Know/No Response	27 (10.6)
A woman to her baby during pregnancy?	
Yes	219 (86.2)
No	25 (9.8)
Don't Know/No Response	10 (3.9)
Do you think HIV can be transmitted through: mosquito bites?	
Yes	66 (26.0)
No	158 (66.2)
Don't Know/No Response	30 (11.8)
Kissing a person who is infected on the mouth?	
Yes	99 (39.0)
No	131 (51.6)
Don't Know/No Response	24 (9.4)

(Continued)

Variable	n (%)
Knowledge of HIV risk and treatment	
Can you identify a person who is infected by looking at him/her?	
Yes	30 (11.1)
No	226 (83.7)
Don't Know/No Response	14 (5.2)
Is it possible for a woman who is infected with HIV to get pregnant?	
Yes	236 (87.4)
No	15 (5.6)
Don't Know/No Response	19 (7.0)
Is it possible to cure HIV/AIDS with medicine?	
Yes	38 (14.1)
No	201 (74.4)
Don't Know/No Response	31 (11.4)
Can the medication help a person living with HIV to have a normal life?	
Yes	113 (41.8)
No	81 (30.0)
Don't Know/No Response	76 (22.2)
Behaviors	
Age at onset of sex work (years)	
Mean (SD)	20.0 (4.62)
Number of Clients in the past 24 hours ^b	
Median (range)	7 (0–39)
Practice douching	
Yes	248 (91.8)
No	20 (7.4)
Don't Know/No Response	2 (0.7)
Had sex with any other person(s) apart from client in the past 7 days	
Yes	84 (31.1)
No	181 (67.0)
Don't Know/No Response	5 (1.9)
Do you have a stable partner?	
Yes	120 (44.4)
No	146 (54.1)
Consistent Condom use with partner ^c	
Always	11 (8.9)
Sometimes/never	112 (90.3)
Don't Know/No Response	1 (0.8)

^aReported for only those who answered “YES” to the question of knowing how HIV/AIDS is being transferred (n = 254);

^bReported for only those with valid response (n = 255); ^c Reported for only those who have stable partner and a valid response (n = 124).

Table 3. Distribution of socio-demographic characteristics by HIV/syphilis and self-reported STI among female sex workers in a HIV prevalence province in Ecuador

Variable	HIV/Syphilis (N = 270)		STI (N = 260)	
	Positive	Negative	Yes	No
Age				
<20 years	3 (3.03)	96 (97.0)	28 (29.5)	67 (70.5)
20–35 years	6 (4.5)	127 (95.5)	33 (25.6)	96 (74.4)
>35 years	2 (5.3)	36 (94.7)	10 (27.8)	26 (72.2)
Age at onset of sex work	**		*	
<18	5 (15.1)	28 (84.8)	15 (48.4)	16 (51.6)
18 and above	6 (2.5)	231 (97.5)	56 (24.4)	173 (75.6)
Marital status				
Married/Cohabiting	6 (3.6)	159 (96.4)	37 (23.3)	122 (76.7)
Single/Previously Married	5 (4.8)	100 (95.2)	34 (33.7)	67 (66.3)
Educational status				
Less than secondary	10 (4.9)	195 (95.1)	59 (30.0)	138 (70.0)
Secondary and Higher	1 (1.72)	57 (98.3)	9 (16.1)	47 (83.9)
Stable partner				
Yes	5 (4.2)	112 (95.8)	39 (33.3)	78 (66.7)
No	6 (4.1)	140 (95.9)	31 (22.3)	108 (77.7)
Have children				
Yes	9 (4.0)	216 (96.0)	60 (27.5)	158 (72.5)
No	2 (4.4)	43 (95.6)	11 (26.9)	31 (73.8)
First Sex work experience				
Voluntary	10 (4.3)	223 (95.7)	62 (27.3)	165 (72.7)
Forced	0 (0.0)	20 (100)	6 (33.3)	12 (66.7)
No response	1 (5.9)	16 (94.1)	3 (20.0)	12 (80.0)
Type of sex worker				
Registered	6 (3.1)	187 (96.9)	57 (30.3)	131 (69.7)
Unregistered	5 (6.5)	72 (93.5)	14 (19.4)	58 (80.6)
Residential time in city				
Less than 1 year	6 (2.9)	201 (97.1)	56 (27.9)	145 (72.1)
At least 1 year	5 (8.1)	57 (91.9)	14 (24.1)	44 (75.9)

* p-value <0.05; ** p-value <0.001

18, those who did so at ≥ 18 years old had 87% reduced odds of HIV/Syphilis infection (AOR 0.13, 95% CI 0.03–0.57). This indicates that younger age at onset of sex work increases the risk of HIV/Syphilis infection. The sum of knowledge of HIV transmission was significantly associated with HIV/Syphilis infection: an increase in the sum of knowledge by one point decreased the odds of HIV/Syphilis infection by 35% (AOR 0.65, 95 % CI 0.48–0.90). In comparison to FSWs who reported consistent condom use, FSWs who sometimes or never used condom had about 6 times elevated odds of HIV/Syphilis infection (AOR 5.83, 95% CI 1.35–25.14).

There were no significant associations between self-reported STI and demographic factors that included age, stable partner and duration of living in the city. However, we observed significant associations between self-reported STI and knowledge of any STI, age of onset of sex work, marital status, and sex with the person(s) other than clients and these associations remained significant in the adjusted model. Compared to sex workers who started selling sex before the age of 18 years, FSW who were 18 and older when they started sex work had 73% reduced odds of self-reported

STI (AOR 0.27, 95% CI 0.11–0.66). This suggests increased odds of STI among FSWs who commenced sex work as teenagers. Single/Previously married FSWs had 81% increased odds of self-reported STI than married/cohabiting FSWs (AOR 1.81, 95% CI 1.01–3.26). Interestingly, in comparison to participants who had knowledge of any infection transmitted by sex, those without any knowledge had 68% reduced odds of self-reported STI (AOR 0.32, 95% CI 0.13–0.78). Participants who reported having sex exclusively with clients had 69% reduced odds of self-reported STI than those who had sex with non-clients (AOR 0.31, 95% CI 0.16–0.57).

Unadjusted analysis (not reported) showed associations between demographic factors (age, marital status, educational status and stable partner) and condom use but they were not significant. After adjusting for potential socio-demographic confounders, the relationship between condom use and the following variables were significant: knowledge of any STI/HIV transmission, age of onset of sex work, type of sex work, residential time in the city, routine gynecological check-up and HIV/syphilis test result. Compared to sex workers who started selling sex when they were younger than 18 years, FSW who were 18 and older when they began sex work had about 17 times higher odds of consistent condom use (AOR 16.73, 95% CI 3.52–79.55). The number of clients FSWs had within 24 h prior to survey administration was significantly associated with consistent condom use. An increase in the number of clients by one elevated the odds of reporting consistent condom use by 59% (AOR 1.59, 95% CI 1.08–2.34). Participants who had lived in the city for at least a year had an 80% reduced odds of reporting consistent condom use than those who had lived in the city less than a year (AOR 0.20, 95% CI 0.003–0.21). FSWs who did not know about any infection which is transmitted by sex were 89% less likely to use condom consistently (AOR 0.11, 95% CI 0.03–0.44), and those who had high knowledge of HIV transmission had approximately 6 times higher odds of reporting consistent condom use than those with low-level knowledge on HIV transmission (AOR 5.97, 95% CI 1.21–29.39). Compared to FSWs who did not go for routine gynecological check-ups, those who visited the health centers for routine check-ups had 24 times higher odds of reporting consistent condom use (AOR 24.45, 95% CI 4.81–124.30). Participants who tested negative for HIV or syphilis had 6 times higher odds of reporting consistent condom use than those who tested positive.

4. Discussion

We found relatively low HIV and syphilis prevalence rates among FSWs (0.7% and 3.3%, respectively) in this region of Ecuador, however, none of them knew about their positivity. On the other hand, the prevalence of self-reported STI within 3 months prior to survey administration was high with over one-quarter of FSWs being infected. This may be explained by the differences in the basic reproductive ratio (R_0) among HIV/syphilis and other STIs as well as the effect of the cumulative prevalence of other STIs. The level of HIV infection found in this population was lower than the prevalence of 1.2–2.6% reported in previous studies in Latin America (Miller et al., 2013; Montano et al., 2005). In comparison to the results from previous studies conducted in two different cities in Ecuador, the prevalence of HIV in this study was slightly higher than the rate of 0.5% reported among FSWs in Quito but much lower than the 2.1% reported in Guayaquil (Belza & Spanish Group for the Unlinked Anonymous Survey of HIV Seroprevalence in STD Patients, 2004; Hierholzer et al., 2002). However, our findings are similar to the relatively low rates of HIV found among FSWs in some South American regions such as Bogota Colombia, and rural provinces of Peru (Hierholzer et al., 2002).

The high prevalence of HIV/syphilis and STI among young age groups including the FSWs that started sex work before the age of 18 years is consistent with most studies conducted among the Latin American population (Baral et al., 2012; Tao et al., 2014). This highlights the vulnerability that younger FSWs, who constitute the majority of this population, have for acquisition and transmission of HIV/STI infection. The higher prevalence and higher odds of disease among this group of women require immediate interventions to educate FSWs on risk reduction strategies to prevent HIV/STI infection. The demonstrated increased vulnerability of younger girls suggest that they might not have adequate knowledge of STI prevention and might be unable to negotiate safer sex practices with clients. Of particular interest is the high proportion (12.2%) of participants who started sex work below the age of 18 years, even though the legal age of sex work in Ecuador is

18 years (MSP, 2015). This is of concern as these young individuals had higher odds of HIV/syphilis and self-reported STI compared to those who began sex work at age 18 years and older.

Another factor associated with HIV/syphilis infection is inconsistent condom use. Condom use is a practical approach for reducing transmission and acquisition of HIV/STI infection among FSWs; therefore, prevention messages around consistent use of condoms during sexual intercourse are essential for HIV prevention. Decreased knowledge about HIV transmission was associated with higher odds of HIV/syphilis infection, suggesting that knowledge empowers the population and aids in avoiding risky sexual behaviors for STI acquisition. Interestingly, it was found that lack of knowledge of STI was associated with low odds of self-reported STI. This might be due to FSWs becoming informed after being diagnosed with STI. As a result, FSWs with lack of knowledge would be less likely to report STI in the 3 months previous to the survey because they were not aware of them. There could also be some unfamiliarity with what constitutes the STI symptom and therefore, those who had less knowledge would be less likely to recognize the presence of an STI and hence less likely to report having one. We also found that FSWs with less than secondary education had higher odds of STI although this association did not reach statistical significance. According to Solomon 2008, FSWs in Ecuador with lower educational levels were disproportionately afflicted with STIs and participated in more high-risk behaviors. Low educational level may leave FSWs vulnerable to STIs and the associated risk factors. The findings of our study are similar to other studies that identified that lower educational level was associated with more STIs (Chen et al., 2015; Solomon, Smith, & Del Rio, 2008), poorer knowledge of HIV/AIDS, and earlier age at onset of sex work ($p = 0.05$) (Solomon et al., 2008).

There are a few limitations in this study. The study populations were not truly selected at random and thus may not be representative of the FSWs population limiting the generalizability of our findings. Even though most community-based studies can be affected by volunteer and social desirability biases (Hong et al., 2012), this should be limited in our study because sex work is legal in Ecuador.

This study also has important strengths. Namely, the number of participants recruited was equal to the estimated sample. This may be because the sampling method used allowed us to recruit different categories of FSWs in Ecuador, including the “hard to reach” FSW.

In conclusion, in a high HIV prevalent region of Ecuador, among FSWs the prevalence of HIV and syphilis was low but self-reported STIs was high, and this study identified several risk factors that provide scientific evidence for health policy decisions like the strength of health promotion and education programs for FSWs, especially among the youngest.

Funding

The authors received no direct funding for this research.

Author details

Isabel Hernandez^{1,2}
E-mail: mihernandez@puce.edu.ec
ORCID ID: <http://orcid.org/0000-0003-3230-6701>
Miguel Reina-Ortiz^{3,4}
E-mail: mreina@health.usf.edu
Korede K. Yusuf³
E-mail: kadegoke@health.usf.edu
Tatiana Ochoa^{3,5}
E-mail: tatiana.ochoa@moffitt.org
Carlos Rosas²
E-mail: rcrvaxel@hotmail.com
Vinita Sharma²
E-mail: vsharma1@health.usf.edu
Eknath Naik³
E-mail: enaik@health.usf.edu
Hamisu M. Salihu⁶
E-mail: hamisu.salihu@gmail.com
Santiago Terán²
E-mail: santi.teran.d.m@gmail.com

Ricardo Izurieta²

E-mail: rizurieta@health.usf.edu

Enrique Teran²

E-mail: eteran@usfq.edu.ec

ORCID ID: <http://orcid.org/0000-0001-6979-5655>

¹ Facultad de Enfermería, Pontificia Universidad Católica del Ecuador, Quito, Ecuador.

² Colegio de Ciencias de la Salud, Universidad San Francisco de Quito, Quito, Ecuador.

³ Department of Global Health, College of Public Health, University of South Florida, Tampa, FL, USA.

⁴ Fundación Raíces, Esmeraldas, Ecuador.

⁵ Moffitt Cancer Center, Tampa, FL, USA.

⁶ Baylor College of Medicine, Houston, TX, USA.

Citation information

Cite this article as: Risk factors for HIV and STI among female sex workers in a high HIV prevalent region of Ecuador, Isabel Hernandez, Miguel Reina-Ortiz, Korede K. Yusuf, Tatiana Ochoa, Carlos Rosas, Vinita Sharma, Eknath Naik, Hamisu M. Salihu, Santiago Terán, Ricardo Izurieta & Enrique Teran, *Cogent Medicine* (2019), 6: 1565292.

References

- Baral, S., Beyrer, C., Muessig, K., Poteat, T., Wirtz, A. L., Decker, M. R., ... Kerrigan, D. (2012). Burden of HIV among female sex workers in low-income and middle-income countries: A systematic review and meta-analysis. *The Lancet Infectious Diseases*, 12(7), 538–549. doi:10.1016/S1473-3099(12)70010-5
- Belza, M. J.; Spanish Group for the Unlinked Anonymous Survey of HIV Seroprevalence in STD Patients. (2004). Prevalence of HIV, HTLV-I and HTLV-II among female sex workers in Spain, 2000–2001. *European Journal of Epidemiology*, 19(3), 279–282.
- Calonge, N., USPSTF. (2004). Screening for syphilis infection: Recommendation statement. *Annals of Family Medicine*, 2(4), 362–365.
- Carael, M., Slaymaker, E., Lyerla, R., & Sarkar, S. (2006). Clients of sex workers in different regions of the world: Hard to count. *Sexually Transmitted Infections*, 82(suppl 3), iii26–iii33. doi:10.1136/sti.2006.021196
- CARE. (2008). *Reunión de Empresarios Comprometidos*. Quito: Reunión de Empresarios Comprometidos.
- Chen, Y., Shen, Z., Morano, J. P., Khoshnood, K., Wu, Z., Lan, G., ... Chen, J. (2015). Bridging the epidemic: A comprehensive analysis of prevalence and correlates of HIV, hepatitis C, and syphilis, and infection among female sex workers in Guangxi province, China. *PloS one*, 10(2), e0115311. doi:10.1371/journal.pone.0115311
- De Boni, R., Veloso, V. G., & Grinsztejn, B. (2014). Epidemiology of HIV in Latin America and the Caribbean. *Current Opinion in HIV and AIDS*, 9(2), 192–198. doi:10.1097/COH.0000000000000031
- Hernandez, I., Reina-Ortiz, M., Johnson, A., Rosas, C., Sharma, V., Teran, S., ... Izurieta, R. (2017). Risk factors associated with HIV among men who have sex with men (MSM) in Ecuador. *American Journal of Men's Health*, 11(5), 1331–1341. doi:10.1177/1557988316646757
- Hierholzer, J., Montano, S., Hoelscher, M., Negrete, M., Hierholzer, M., Avila, M. M., ... Carr, J. K. (2002). Molecular epidemiology of HIV type 1 in Ecuador, Peru, Bolivia, Uruguay, and Argentina. *AIDS Research and Human Retroviruses*, 18(18), 1339–1350. doi:10.1089/088922202320935410
- Hong, Y., Zhang, C., Li, X., Fang, X., Lin, X., Zhou, Y., Liu, W. (2012). HIV testing behaviors among female sex workers in Southwest China. *AIDS and Behavior*, 16(1), 44–52. doi:10.1007/s10461-011-9960-8
- Instituto Nacional de Estadísticas y Censos. (2013). *Resultados del censo 2010 de población y vivienda en el Ecuador* [Results of the 2010 population and housing census in Ecuador]. Quito: Fascículo Nacional.
- Li, Z., Li, D., Liu, H., Jiang, Z., Zhu, L., & Wang, N. (2014). Study on the prevalence and associated risk factors related to HIV, syphilis, herpes simplex virus-2 among female sex workers in Jiaozhou, Shandong province. *Zhonghua liu xing bing xue za zhi*, 35(10), 1099–1104.
- Miller, W. M., Buckingham, L., Sánchez-Domínguez, M. S., Morales-Miranda, S., Paz-Bailey, G. (2013). Systematic review of HIV prevalence studies among key populations in Latin America and the Caribbean. *Salud publica de Mexico*, 55(Suppl 1), S65–S78. doi:10.21149/spm.v55s1.5099
- Montano, S. M., Sanchez, J. L., Laguna-Torres, A., Cuchi, P., Avila, M. M., Weissenbacher, M., ... Galeano, A. H. (2005). Prevalences, genotypes, and risk factors for HIV transmission in South America. *JAIDS*, 40(1), 57–64.
- Morris, M., Podhisita, C., Wawer, M. J., & Handcock, M. S. (1996). Bridge populations in the spread of HIV/AIDS in Thailand. *AIDS*, 10(11), 1265–1271.
- MSP. (2010). Informe Nacional Sobre los Progresos Realizados en la Aplicación del UNGASS- Ecuador. Enero de 2008- Diciembre de 2009.
- MSP. (2011). *Actualización del Plan Estratégico Multisectorial de la Respuesta Nacional al VIH 2007 – 2015 – Planes Operativos Multisectoriales 2011–2013*. Quito. Retrieved from <http://www.unaids.org/en/dataanalysis/datatools/aidsinfo/>
- MSP. (2015). *El reglamento para el funcionamiento de centros de tolerancia es socializado Ecuador: Agencia Nacional de Regulación, Control y Vigilancia Sanitaria*. Retrieved from <http://www.controlsantario.gob.ec/el-reglamento-para-el-funcionamiento-de-centros-de-tolerancia-es-socializado/>
- Solomon, M., Smith, M., & Del Rio, C. (2008). Low educational level: A risk factor for sexually transmitted infections among commercial sex workers in Quito, Ecuador. *International Journal of STD & AIDS*, 19(4), 264–267. doi:10.1258/ijsa.2007.007181
- Tao, X. H., Jiang, T., Shao, D., Xue, W., Ye, F., Wang, M., & He, M. (2014). High prevalence of syphilis among street-based female sex workers in Nanchang, China. *Indian Dermatology Online Journal*, 5(4), 449. doi:10.4103/2229-5178.142491
- UNGASS. (2008). Declaración de Compromiso Sobre VIH-SIDA.
- World Bank. (2015). Data—Ecuador. Retrieved from <http://data.worldbank.org/country/ecuador>
- Zoni, A. C., González, M. A., & Sjögren, H. W. (2013). Syphilis in the most at-risk populations in Latin America and the Caribbean: A systematic review. *International Journal of Infectious Diseases*, 17(2), e84–e92. doi:10.1016/j.ijid.2013.02.015



© 2019 The Author(s). This open access article is distributed under a Creative Commons Attribution (CC-BY) 4.0 license.

You are free to:

Share — copy and redistribute the material in any medium or format.

Adapt — remix, transform, and build upon the material for any purpose, even commercially.

The licensor cannot revoke these freedoms as long as you follow the license terms.

Under the following terms:

Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made.

You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

No additional restrictions

You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

Cogent Medicine (ISSN: 2331-205X) is published by Cogent OA, part of Taylor & Francis Group.

Publishing with Cogent OA ensures:

- Immediate, universal access to your article on publication
- High visibility and discoverability via the Cogent OA website as well as Taylor & Francis Online
- Download and citation statistics for your article
- Rapid online publication
- Input from, and dialog with, expert editors and editorial boards
- Retention of full copyright of your article
- Guaranteed legacy preservation of your article
- Discounts and waivers for authors in developing regions

Submit your manuscript to a Cogent OA journal at www.CogentOA.com

