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## Prevalence and correlates of cervical abnormalities among female sex workers in Tijuana, Mexico

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### Abstract

**Objectives:** In Tijuana, Mexico, sex work is regulated by the municipal health department and includes regular testing for HIV and other sexually transmitted infections (STIs) for registered female sex workers (FSWs). However, Pap testing is missing from current sexual health assessments. We aimed to answer the following research questions: 1.) What is the prevalence of cervical abnormalities among a sample of FSWs in Tijuana, Mexico? 2.) What are the correlates of cervical abnormalities among a sample of FSWs in Tijuana, Mexico?

**Study design:** From 2013-2014, a cohort of 300 FSWs in Tijuana, Mexico were recruited using modified time-location sampling. Participants were given Pap, HIV, and STI tests.

**Results:** The prevalence of an abnormal Pap was 11.7% (35/300). FSWs ever registered with municipal health services were less likely to have an abnormal Pap result (4.8% vs 14.4%,  $p=0.03$ ), were more likely to report a previous Pap test (88.1% vs 70.4%,  $p=.001$ ), and were more likely to report a sexual health checkup in the last year (60.7% vs 37.0%,  $p<0.001$ ) than those who had never been registered.

**Conclusions:** FSWs remain at risk for cervical abnormalities, including those registered with the municipality.

### Short Summary:

We conducted Pap testing for female sex workers in Tijuana, Mexico and found that over 11% had abnormal Pap test results.

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The authors declare no conflicts of interest

## Keywords

Cervical Cytology; screening; HIV women; female sex workers; Tijuana

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## Introduction

Cervical cancer screening detects pre-cancerous changes in the cervix and is an important part of women's preventive healthcare.<sup>1</sup> Most women who undergo cervical screening have normal results, however some present with cell abnormalities. While abnormal screening results are often benign, some cervical cell abnormalities can lead to cervical cancer if left untreated, such as moderate and high-grade cervical intraepithelial neoplasia (CIN).<sup>2</sup>

Cervical cancer is the fourth most common cancer in women, with an estimated 528,000 new cases in 2012. Approximately 85% of the global burden of cervical cancer occurs in less developed regions of the world.<sup>3</sup> In Mexico, cervical cancer accounts for 16.9% of all cancers among women, with an incidence of 23.3 per 100,000 women, and is one of the top two causes of cancer mortality for women.<sup>3</sup> Cervical cancer is caused by a sexually acquired infection with certain types of human papillomavirus (HPV).<sup>4</sup>

Cervical abnormalities and cervical cancer detection using Papanicolaou (Pap) testing has led to reductions in cervical cancer incidence and mortality throughout the world.<sup>5,6</sup> Cervical cancer incidence is high in low-income populations, where screening and early detection programs are less accessible.<sup>7,8</sup> In Mexico, studies have shown that increases in Pap screening coverage are correlated with decreases in cervical cancer mortality.<sup>9</sup> However, Pap screening rates and cervical cancer incidence rates vary from region to region in Mexico.<sup>9</sup> For example, research suggests relatively low rates of Pap screening among women who reside in Mexican cities located on the United States-Mexico border.<sup>10-12</sup>

Mexican cities along the northern border with the United States have active sex work scenes that also tend to be sites for sexual tourism. Approximately 9,000 female sex workers (FSWs) work in Tijuana, a city in the Mexican state of Baja California that is adjacent to San Diego, CA, USA.<sup>13</sup> Tijuana's sex industry is concentrated in the *Zona Roja* ('red light' district) where FSWs are required to pay for and obtain permits if they wish to work without prosecution by law enforcement. Sex work is regulated by the Servicios Médicos Municipales (Municipal Health Services). Registered sex workers are expected to undergo regular testing for HIV and some sexually transmitted infections (STIs) at their own expense; HPV and Pap testing is neither required nor offered.<sup>14</sup> Women who test positive for STIs are provided treatment according to federal STI guidelines<sup>15</sup>, and if they test positive for HIV their sex work permits are revoked and they are referred to care.<sup>14</sup> In practice, over half of FSWs operate without permits in Tijuana.<sup>16</sup> Further, a sizeable amount of sex trade occurs at sites outside of the *Zona Roja*.

Research has shown that FSWs who work in Tijuana often engage in sexual behaviors that increase their risk of acquiring high risk HPV infections as well as other STIs, such as condomless vaginal and anal sex.<sup>17-19</sup> Thus, Pap screening is particularly important for FSWs in order to detect and treat cancer-causing cervical cell abnormalities. However, little

is known about Pap testing rates among FSWs in Mexican cities along the Mexico-U.S. border region, such as Tijuana, and there is a paucity of research in general on FSWs in this region.

Given the size of the sex industry in Tijuana, Mexico, and the high risk that FSWs face of acquiring cervical cancer and STIs,<sup>20-22</sup> research is needed to understand the prevalence of cervical screening, as well as cervical abnormalities and their correlates among FSWs in this context to inform screening and health guidelines. Towards this end, we aimed to answer the following research questions: 1.) What is the prevalence of cervical abnormalities among a sample of FSWs in Tijuana, Mexico? 2.) What are the correlates of cervical abnormalities among a sample of FSWs in Tijuana, Mexico?

## Materials and methods

### Data Collection

From March 2013 to March 2014, a prospective cohort of 300 FSWs<sup>23,24</sup> were recruited and enrolled into the epidemiologic study, *Mapa de Salud*, using modified time-location sampling in both indoor and outdoor sex work venues throughout Tijuana. Eligible participants were aged 18 years or older, biologically female, agreed to receive treatment for any STIs detected, resided in Tijuana, reported having exchanged sex for money or goods in the past month, and reported no plans to permanently move outside the city for the duration of follow-up (18 months). After providing informed consent, participants underwent the baseline, interviewer-administered survey using computer-assisted personal interviewing (CAPI). These face-to-face interviews collected socio-demographic and behavioral data, including information on drug use, sexual practices, clinical information and access to health services.

Participants provided a blood specimen, which was obtained by venipuncture, centrifuged on site, and split into aliquots for sample storage and, if the initial rapid tests were positive or indeterminate, HIV and syphilis serology. HIV screening was conducted using the rapid SURE CHECK HIV ½ Assay (Chembio Diagnostics Systems Inc., Medford, NY). Specimens that screened HIV positive or indeterminate were transported to the San Diego County Public Health Laboratory for confirmatory testing using the BioRad Multispot HIV-1/HIV-2 assay (Bio-Rad Laboratories, Redmond, WA). Syphilis screening was conducted using the SD BIOLINE Syphilis 3.0 (Standard Diagnostics, Inc., Gyeonggi-do, Republic of Korea) rapid test. Syphilis confirmatory testing to determine if treatment was required was conducted using the rapid plasma reagin (RPR) test (Macro-Vue, Becton Dickenson, Cockeysville, MD, USA) and *Treponema pallidum* hemagglutination assay (TPHA) (Fujirebio, Wilmington, DE, USA), which were both conducted at the San Diego County Public Health Laboratory.

A trained laboratory technician collected vaginal swabs for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infection screening using an Aptima Vaginal Swab Specimen Collection Kit (Hologic, San Diego, CA). Vaginal swab specimens, labeled with a participant identification number, were stored at room temperature and batched for bi-weekly transport to the San Diego County Public Health Laboratory. Testing was performed

using nucleic acid amplification tests: the Aptima® Combo 2 assay (Hologic, San Diego, CA). All chlamydia, gonorrhea and syphilis cases were provided with free treatment according to national guidelines<sup>15</sup>. Those who tested positive for HIV were referred to local public health providers in Tijuana and offered transportation and assistance with setting appointments.

In the current study, one-time cervical swabs for Pap smears were obtained by a trained laboratory technician. Pap smear slides were sent to the local study pathologist at Patología y Citología del Río in Tijuana, Mexico for histological classification according to the Bethesda system. Women with abnormal cytology results from the Pap smear were referred to a gynecologist for further testing if indicated, including biopsy.

Ethical approval for this study was granted by the institutional review boards of the University of California San Diego (Federal wide Assurance number: FWA00004495, Project number: 100148) and El Colegio de la Frontera Norte in Tijuana (Federalwide Assurance number: FWA00012463).

### Statistical Analysis

Descriptive statistics were used to examine study participant characteristics. Chi-square, Fisher's exact tests or two-tailed T-tests were used to test the association of the exploratory variables with the Pap test result outcome. We conducted bivariate Poisson regression with robust variance and reported prevalence ratios and 95% confidence intervals (CI) to describe correlations between chlamydia, gonorrhea, syphilis, and HIV infections with dichotomous (abnormal versus normal) Pap test results. All analyses were carried out with STATA version 13 (College Station, TX, USA).

### Results

300 FSW participants had Pap tests as part of this study. Participant characteristics are included in Table 1. We identified an abnormal Pap result in 11.7% (35/300), of which 10 (28.6%) were categorized as atypical squamous cells of undetermined significance (ASCUS), 15 (42.9%) as cervical intraepithelial neoplasia (CIN) level 1, 6 (17.1%) CIN2 and 2 (5.7%) CIN3 [Fig 1]. Of the 35 abnormal Pap results, 2 were not classified.

Only 226 of 300 (75.3%) reported having ever had a Pap test in their lifetime, of whom 26 (11.5%) reported a previous abnormal Pap. Of those who reported ever having a Pap test, 140 (61.9%) had a Pap test within the last 3 years and, of those, 54 (38.6%) had a Pap in the last 12 months.

Of those 226 who reported ever having a Pap test, 23 (10.2%) had an abnormal Pap test in the study and of the 26 who reported a previous abnormal Pap, 5 (19.2%) had an abnormal Pap as part of the study. Fewer women who reported a previous pap test had an abnormal result than those without a previous pap test, but the difference was not significant (10.2% vs 16.2%,  $p=0.16$ ). A total of 33 participants in the study reported that they had ever been told by a doctor or nurse that they have HPV infection or genital warts, and of those, 2 had an abnormal Pap test result in our study (6.1%). Those that reported a sexual health checkup in

the past year (43.7%) were less likely to have an abnormal Pap test result than those who did not have a sexual health checkup in the past year (7.6% vs 14.8%,  $p=0.055$ ).

Registration with the municipal health services as sex workers was not common among our participants. Just 61 (20.3%) had current registration with the municipality and an additional 23 reported they had been registered in the past. Women who had ever registered with municipal health services as a sex worker were less likely to have an abnormal Pap result (4.8% vs 14.4%,  $p=0.03$ ), more likely to report a previous Pap test (88.1% vs 70.4%,  $p<0.001$ ), and more likely to report a sexual health checkup in the last year (60.7% vs 37.0%,  $p<0.001$ ) than those who had never been registered.

In addition, participants who had an abnormal Pap result tended to be younger the first time they had sex in exchange for money (mean age of 20.4 years, 95% CI: 18.5, 22.3) than those who had a normal pap result (mean age of 23.2 years, 95% CI: 22.3, 24.1) ( $p=0.0345$ ).

However, mean time in sex work (10.3 years overall) was not significantly associated with the Pap result ( $p=0.218$ ). Of note, 72 participants (24%) reported that they entered sex work as a minor (under the age of 18). The mean age of entry into sex work for those that entered as minors was 15.2 years ( $SD=1.5$ ), however, entering sex work as a minor was not significantly associated with abnormal Pap results.

Of the 300 active sex workers in our study, 8 had a positive HIV test result at baseline, 19 tested positive for gonorrhea, 81 tested positive for chlamydia, and 55 tested positive for antibodies to *Treponema pallidum*, the organism that causes syphilis, (of whom 19 had a titer suggestive of an active infection (RPR titer $\geq$ 1:8)) [Table 1]. The prevalence of chlamydia was higher among those with an abnormal Pap (PR=2.5, 95% CI: 1.4, 4.7).

## Discussion

We conducted Pap testing in a cohort of female sex workers in Tijuana, Mexico. We found that over one tenth had abnormal Pap test results and a quarter reported never having a previous Pap test. Just over a quarter of the cohort had ever been registered as a sex worker with the municipality, but we found that rates of abnormal Pap results were lower for those who had ever been registered when compared to those who had never been registered, despite Pap smear testing not currently being offered through registration. Additionally, those who had a history of registration as a sex worker reported higher rates of previous Pap tests. . Having a sexual health exam in the past year was also significantly associated with a lower prevalence of abnormal Pap test results and registration as a sex worker with the municipality. More frequent testing among those who were registered may have led to early treatment and halting high grade abnormalities. Lastly, we found high rates of STIs among the sample, including HIV, chlamydia, gonorrhea, and evidence of either current or past syphilis infection.

Registration with the municipal government as a FSW has been shown in a previous study in Tijuana to be associated with increased rates of previous HIV testing and lower rates of positive STI results when compared to unregistered FSWs.<sup>14</sup> Pap tests are not included as part of the laboratory tests that are conducted for registration with the municipality. We

hypothesize, however, that those who are registered may have improved access to preventive health services or may be more empowered to seek out preventive health services as legal workers, which is demonstrated by the association we detected between having a sexual health exam in the past year and registration with the municipality. In addition, cost may be a barrier to registration with the municipality as a FSW and may be associated with not accessing preventive health services.

Sex workers have a higher risk of HPV infection and thus may be at greater risk for cervical cancer than non-sex workers.<sup>25,26</sup> Our study, however, did not include HPV screening. Other studies in Mexico including those in Morelos, Jalisco and rural areas that conducted Pap testing (not specifically of sex workers) found 2.4%-5.6% of women screened had abnormal Pap results<sup>27-29</sup>, while we found over 11% of FSWs in our study had abnormal Pap test results. A study in Peru among FSWs found that 43.6% of participants tested positive for at least one oncogenic HPV infection.<sup>25</sup> This high point prevalence of HPV infections suggests a high sexual exposure to HPV despite high rates of reported consistent condom use. The study in Peru found a prevalence of abnormal Pap test results of 7.5%, lower than in our study in Mexico.<sup>25</sup>

We found that participants who had an abnormal pap result tended to be younger the first time they had sex in exchange for money than those who had a normal pap result. While abnormal pap results are not the same as HPV infections, most abnormal pap results are caused by HPV infections. As such, our findings partially support research that finds a relationship between age at first intercourse and HPV infections. One such study in Tijuana found that FSWs entering into sex work as minors were 30% less likely to negotiate condom use and had more total clients per month (54 versus 46 per month)<sup>30</sup>, both risk factors related to cervical abnormalities caused by HPV. Further, being minors would have precluded them from registering as a sex worker with the municipal health services and receiving healthcare via that mechanism. Other studies among non-sex worker cohorts have found that younger age at first intercourse was associated with behavior that might increase the risk of HPV infections, including a higher number of sexual partners.<sup>31,32</sup> A study in China also found that HPV infection in FSWs was associated with age at first sexual intercourse. The same study found that current age was associated with HPV infection. FSWs younger than 21 and those older than 51 years of age were at significantly higher risk of HPV infection. However, that study did not find an association between time in sex work and HPV infection.<sup>33</sup>

We also found high rates of STIs among our sample, which is consistent with previous research on FSWs in other Mexican locales, as well as FSWs in Tijuana.<sup>14,18,34</sup> The high rate of STIs among our sample suggests that many engage in risky sexual behaviors that leave them vulnerable to infection. Indeed, we found nearly 25% of participants reported that in the past 30 days they did not always use condoms with new or irregular clients and nearly 40% did not always use condoms with regular clients. Prior research also demonstrates high rates of risky sexual behaviors among FSWs in Tijuana, such as condomless vaginal and/or anal intercourse.<sup>18,19,35</sup>

This study is not without limitations. Our modest sample size and the relatively small number of cervical abnormalities within the sample did not allow for multivariable analyses. In addition, this sample may not have been representative of the entire population of FSWs in Tijuana and therefore the results may not be generalizable, however, participants came from throughout the city and the sampling strategy aimed to reach a more representative sample of FSWs than prior studies in the region. This sample only includes those who self-reported exchanging sex for money or goods, and therefore may have missed those that are not empowered or who feel too stigmatized to admit they have participated in sex work. We conducted Pap testing at one point in time and not throughout follow-up for this cohort study, so we are not able to differentiate incident cervical abnormalities or determine the temporality of associations that we detected. In addition, some abnormal Pap results were not classified. This is a limitations of the clinically collected data in our study. Cervical cancer screening data are not routinely collected from FSWs, and cervical cancer may develop many years after initial HPV infection. We did not test for the presence of HPV infection, a precursor of cervical cancer, which would be detectable earlier than signs of cervical cancer are detected from a Pap test.

## Conclusions

In conclusion, while testing for HIV and some STIs is done on a regular basis for registered sex workers in Tijuana, Mexico, they remain at risk for HPV and cervical abnormalities. Regular cervical cancer screening is highly recommended to reduce the morbidity and mortality related to late stage disease. In our sample, the high prevalence of abnormal Pap results and moderate level of prior screening demonstrates a need to integrate Pap screening, and perhaps HPV vaccination, into existing routine STI screening for FSWs.

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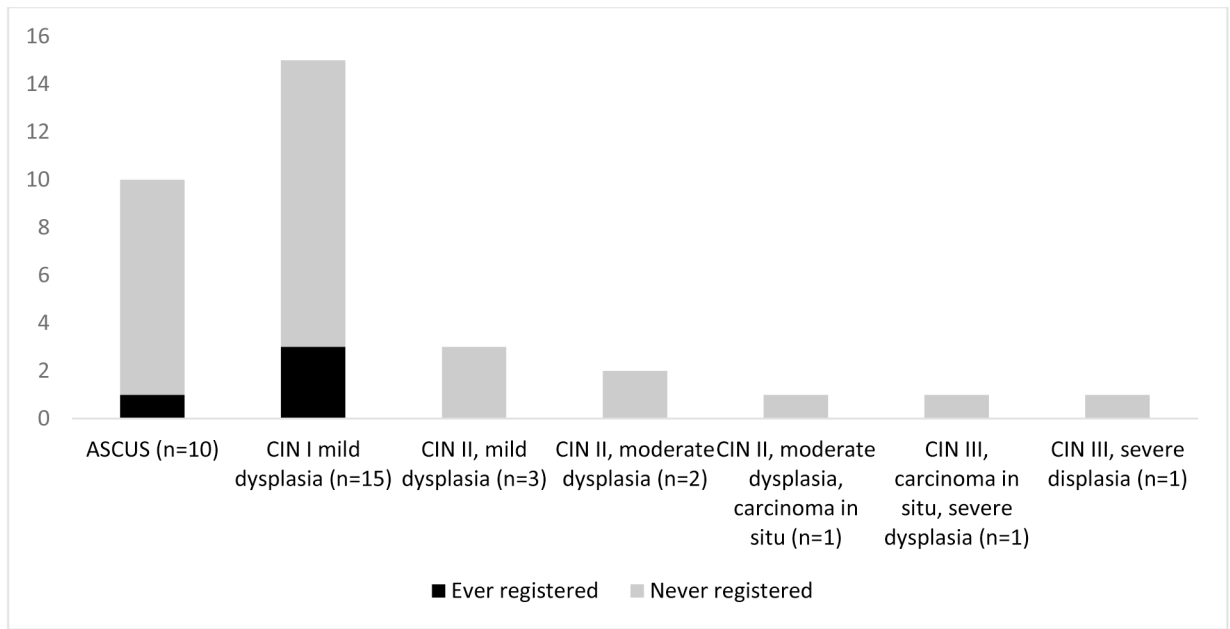
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**Figure 1.**

Abnormal Pap test results among female sex workers in Mexico for those ever registered and never registered with the municipality to legally work as a sex worker (n=35), March 2013 to March 2014.

Note that 2 participants with abnormal Pap results were not categorized

**Table 1.**

Baseline characteristics of 300 female sex worker participants in Tijuana, Mexico, March 2013 to March 2014.

Median age	32 (IQR: 25-40)
Civil Status:	
Single	120 (40.0%)
Married	103 (34.3%)
Divorced/separated	61 (20.3%)
Widowed	16 (5.3%)
Mean years of education (starting at primary school level)	8.1 (SD: 2.8)
Mean number of male clients in the previous 30 days	16.8 (SD: 19.3)
Condom Use (in the past 30 days):	
Always with new or irregular client	198 (76.5%)
Always with regular client	159 (62.1%)

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**Table 2.**

Pap test result from 300 female sex workers in Mexico by STI and HIV infection status, March 2013 to March 2014 (N=300).

	<b>Abnormal Pap Test Result (n=35) n (%)</b>	<b>Normal Pap Test Result (n=265) n (%)</b>	<b>PR* (95% CI)</b>
<b>HIV infected (n=8)</b>	2 (5.7%)	6 (2.3%)	2.21 (0.64, 7.68)
<b>Chlamydia positive (n=81)</b>	17 (48.6%)	64 (24.2%)	2.54 (1.38, 4.69)
<b>Gonorrhea positive (n=19)</b>	4 (11.4%)	15 (5.7%)	1.91 (0.75, 4.85)
<b>Evidence of current or past syphilis infection (n=55)</b>	6 (17.1%)	49 (18.5%)	0.95 (0.41, 2.19)

\* Prevalence ratios (PR) from bivariate Poisson regression with robust variance and 95% confidence intervals (CI) to describe correlations between chlamydia, gonorrhea, syphilis and HIV infections with dichotomous (abnormal versus normal) pap test results among female sex workers in Tijuana, Mexico

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