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Doxycycline pre-exposure prophylaxis prevents sexually transmitted infections without affecting vaginal bacterial flora in female sex workers

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Background: Bacterial sexually transmitted infections (STIs) like syphilis, chlamydia and gonorrhoea are often asymptomatic but can cause severe complications, including infertility and vertical transmission in cisgender women, particularly female sex workers (FSWs). Sex work is strongly associated with syphilis, with FSWs representing 38% of syphilis cases among Japanese women in 2021. Despite doxycycline's proven effectiveness in preventing bacterial STIs, its efficacy in high-risk cisgender women remains inconclusive, highlighting the need for targeted STI prevention strategies in this population.

Objectives: We investigated the effectiveness of doxycycline pre-exposure prophylaxis (doxyPrEP) in preventing STIs and its impact on vaginal flora among FSWs.

Participants and methods: This retrospective study included 40 FSWs aged ≥18 years who initiated doxyPrEP (100 mg/day) for STI prevention at a private clinic in Tokyo, Japan, between 1 October 2022 and 14 November 2023. Incidence rate ratios (IRR) for chlamydia, gonorrhoea, syphilis, bacterial vaginosis (BV), and vulvovaginal candidiasis (VVC) were estimated using fixed-effects Poisson regression models. Adherence, side effects, and satisfaction were evaluated through follow-up clinical evaluations.

Results: Overall STI incidence significantly declined from 232.3 to 79.2/100 person-years following doxyPrEP initiation (IRR = 0.33, $P = 0.020$). The reduction in chlamydia showed marginal statistical significance (IRR = 0.35, $P = 0.056$), and syphilis cases dropped to zero. Gonorrhoea, BV, and VVC incidence showed no significant changes. Follow-up clinical evaluations indicated high adherence to doxyPrEP, no serious adverse events, and high satisfaction with doxyPrEP.

Conclusions: DoxyPrEP significantly reduced the overall STI incidence among FSWs without increasing other vaginal infections.

Introduction

Most bacterial sexually transmitted infections (STIs) are asymptomatic or present with mild symptoms.[1] However, in cisgender women of reproductive age, STIs can lead to severe complications, including infertility and vertical transmission, affecting subsequent generations.[2] The prevalence of chlamydia and gonorrhoea among cisgender female sex workers (FSWs) has been reported as 7.8%–18% and 12.1%–15% in the United States (US) and Australia, respectively.[3,4] Additionally, the incidence of congenital syphilis in the US has increased nearly 11-fold over the past decade, posing a serious public health concern.[5,6] While the exact prevalence of syphilis among FSWs in Japan has not been extensively documented, a strong correlation exists between sex work and syphilis incidence.[7] In 2021, FSWs accounted for 38% (1010/2686) of all syphilis

diagnoses among Japanese women.[8] These findings underscore the need for developing and implementing targeted STI interventional strategies for cisgender women.

Previous studies have demonstrated the efficacy of doxycycline in preventing bacterial STIs. In a small, open-label pilot study, 30 MSM living with HIV and a history of syphilis were randomized in a 1:1 ratio to receive either daily doxycycline pre-exposure prophylaxis (doxyPrEP; 100 mg) for 48 weeks or a financial incentive-based behavioural intervention. The doxyPrEP group showed a 73% reduction in syphilis, gonorrhoea, and chlamydia incidence compared with the control group ($P=0.02$). Furthermore, most participants in the intervention group exhibited sustained blood doxycycline levels of >1 μg/mL.[9] Doxycycline post-exposure prophylaxis (doxyPEP) has also demonstrated comparable efficacy in preventing STIs among MSM and transgender women (TGW). DoxyPEP has shown significant reductions in bacterial STI incidence, particularly chlamydia and syphilis, but the magnitude of its effect can vary. One RCT among MSM on PrEP reported a hazard ratio (HR) of 0.53 (95% confidence interval, CI 0.33–0.85) for the first STI event, corresponding to reductions of 70% for chlamydia (HR = 0.30) and 73% for syphilis (HR = 0.27). However, this same trial found no significant effect on the first gonorrhoea diagnosis (HR = 0.83, 95% CI 0.47–1.47).[10] Another RCT, assessing relative risk (RR) among MSM and TGW on PrEP as well as people living with HIV (PLWH), found overall STI reductions of 66% (RR = 0.34) in PrEP users and 62% (RR = 0.38) in PLWH. For chlamydia, the reductions were 88% (RR = 0.12) and 74% (RR = 0.26). For syphilis, they were 87% (RR = 0.13) and 77% (RR = 0.23), and for gonorrhoea, 55% (RR = 0.45) and 57% (RR = 0.43).[11] A separate RCT involving MSM on PrEP documented an 83% reduction in combined chlamydia and syphilis (adjusted HR, aHR = 0.17) per 100 person-years, but its aHR of 0.78 (95% CI 0.60–1.01, $P=0.061$) for gonorrhoea did not reach statistical significance.[12] These discrepancies suggest that, while doxyPEP appears highly effective against chlamydia and syphilis, its effectiveness against gonorrhoea may depend on study design, population characteristics and local antimicrobial resistance patterns.

The Centers for Disease Control and Prevention recommends that MSM and TGW diagnosed with bacterial STIs within the past 12 months receive counselling regarding the use of doxyPEP as a preventive measure.[13] However, an RCT in Kenya evaluating doxyPEP for cisgender women did not demonstrate a statistically significant reduction in STI incidence, raising uncertainty about its effectiveness in this population.[14] Adherence concerns were identified, despite evidence that doxycycline effectively penetrates vaginal tissue.[15] A single 200 mg oral dose of doxycycline achieved vaginal concentrations approximately twice as high as those in the plasma remaining above four times the 90% minimum inhibitory concentration (MIC_{90}) for *Chlamydia trachomatis* and *Treponema pallidum* for ≥38 h. Yet, despite these favourable pharmacokinetic properties, its protective effectiveness against STIs among cisgender women remains inconclusive. This study aimed to address this research gap by retrospectively assessing doxycycline prophylaxis in cisgender FSWs.

Methods

Study setting and population

This retrospective study included cisgender FSWs aged ≥18 years who initiated a daily prophylactic dose of doxycycline (100 mg) for STI prevention at the Personal Health Clinic in Tokyo, Japan, between October 1, 2022, and November 14, 2023, the latter date being the data lock date. The 100 mg dose was selected based on prior studies in MSM demonstrating efficacy against bacterial STIs and favourable vaginal tissue penetration.[9,15] DoxyPrEP was not routinely offered but prescribed selectively through shared decision-making as a targeted prevention strategy for high-risk individuals in clinical care, not as a research intervention. FSWs received information on its benefits, administration, and potential side effects, as well as on doxyPEP. The choice between doxyPrEP and doxyPEP was made based on individual preferences.

The Personal Health Clinic specializes in sexual health services, including STI screening, treatment, and prevention strategies such as HIV PrEP, HIV PEP, doxyPEP and doxyPrEP. Many FSWs frequently visit the clinic regularly to fulfil occupational requirements, as employers or agencies often mandate STI testing for 'infection-free certifications', though this is not legally required. These visits are primarily driven by workplace obligations and personal health needs. Given their daily work schedules, FSWs preferred doxyPrEP over doxyPEP, due to its convenience (a single daily dose), a potentially lower incidence of side effects, and improved adherence. FSWs who did not undergo STI testing before or after doxyPrEP initiation were excluded from the study. Baseline STI status was determined using test results from the initial clinic visit. Clinical evaluations and laboratory tests were performed every 1–3 months based on individual preferences. As a part of clinical care, follow-up clinical evaluations assessed adherence to doxyPrEP, reported side effects, condom use practices, and other relevant factors. These evaluations were documented in clinical records to improve service quality but were not specifically structured for research purposes.

Data extraction

Data were obtained from electronic health records (EHRs) of Personal Health Clinics in Japan. The dataset included demographic information (age, sex, race, HIV PrEP status and contraceptive pill use), initial clinic visit dates, doxyPrEP initiation dates, and STI test dates and results for HIV, hepatitis B virus (HBV), chlamydia, gonorrhoea, and syphilis. Vaginal smear results for bacterial vaginosis (BV) and vulvovaginal candidiasis (VVC), were also recorded. Follow-up clinical evaluations on adherence, side effects, benefits, concerns, and changes in condom use were extracted from the EHRs. Data on the incidence of chlamydia, gonorrhoea, syphilis, BV and VVC were collected before and after doxyPrEP initiation. STI testing included HIV antigen/antibody testing, HBV antigen testing, serological testing for *T. pallidum*, and molecular testing for *C. trachomatis* and *Neisseria gonorrhoeae* in both symptomatic and asymptomatic participants.

Serological testing for syphilis included the Rapid Plasma Reagin test for screening and follow-up, with confirmation via the *T. pallidum* haemagglutination assay for confirmation. *C. trachomatis* and *N. gonorrhoeae* were detected using the transcription-mediated amplification (TMA) method, a type of Nucleic Acid Amplification Test. Specimens were typically collected from genital, pharyngeal, and anal sites; however, in our clinical setting, pooled sampling from these sites was sometimes performed to reduce costs and accommodate individual preferences. Vaginal smears were examined microscopically to assess vaginal flora. Chlamydia and gonorrhoea were diagnosed based on positive TMA results. Syphilis was diagnosed by either the first positive Treponema test or a four-fold increase in non-Treponema test titters. BV and VVC were diagnosed based on Gram-stained vaginal smears and subsequent antimicrobial treatment. BV was identified using the Hay-Ison criteria, characterized by predominant *Gardnerella* and/or *Mobiluncus* morphotypes with few or absent *Lactobacilli*. VVC was diagnosed through microscopic detection of budding yeast cells, pseudohyphae, or hyphae in Gram-stained samples.

For any STI test, simultaneous positive results for the same pathogen at multiple anatomic sites (e.g. urethral and rectal chlamydia) were

classified as a single infection, whereas concurrent infections with different pathogens were considered multiple infections, regardless of the site. All FSWs with positive STI test results received antimicrobial treatment per national STI guidelines, irrespective of symptoms presentation.

Statistical analyses

The demographic and clinical characteristics of the study participants were summarized using frequencies and percentages for categorical variables, and medians with IQRs for continuous variables, and totals or means for aggregate measures. We evaluated the effects of doxyPrEP on the incidence and test positivity rates of STIs, BV and VVC among FSWs before and after its implementation. Incidence per 100 person-years, with time at risk calculated from a negative test to the next test: For the period before doxyPrEP initiation, this spanned from the first negative test to the start of doxyPrEP treatment. For the period after doxyPrEP initiation, it covered the time from doxyPrEP initiation to the last recorded test. Fixed-effects Poisson regression models were used to compare the incidence rates before and after doxyPrEP implementation. Incidence rate ratios (IRRs) with 95% CIs reported to assess precision. Statistical significance was set at P value < 0.05. Individual-level confounding factors were adjusted by including participant IDs as a fixed effect. Since FSWs visited more frequently for STI testing and side effect checks after initiating doxyPrEP, test positivity rates and tests per person-year were also analysed. Test positivity rates were calculated as the proportion of positive tests to the total number of tests conducted and expressed as a percentage. All the statistical analyses were performed using Stata version 16 (StataCorp, College Station, TX, USA).

Ethical approval

This study was a retrospective analysis of existing clinical records, approved by the ethics committee of the National Center for Global Health and Medicine (NCGM-S-004809-00). Data were collected using an opt-out consent approach, allowing FSWs to decline the use of their clinical records for research, regardless of their decision to initiate doxyPrEP. Participant confidentiality was rigorously maintained through data anonymization, secure management, and restricted access to authorized personnel. This study was conducted in accordance with the ethical standards of the Institutional and National Research Committee and the Declaration of Helsinki. No financial compensation was provided to the participants.

Results

Baseline characteristics

During the study period, 2680 cisgender women visited the Personal Health Clinic. Exclusions included individuals under 18 years old, those not identified as cisgender FSWs, and those not prescribed doxycycline prophylaxis for STI prevention. Among the 96 FSWs initiated on doxyPrEP or doxyPEP, 6 who received doxyPEP and 50 lacking pre- and post-doxyPrEP STI test results were excluded, leaving 40 FSWs for analysis. Of these, 27 underwent vaginal smear tests before and after doxyPrEP initiation, with data for 22 retrieved from medical records (Figure 1). Most FSWs attended routine visits approximately once every one to 3 months.

The baseline demographic characteristics of the study population are summarized in Table 1. A total of 40 Asian and Japanese participants were included in the study, with a median age of 29 years (IQR: 26–33.5) at the first test. Most received HIV PrEP and contraceptive pills during the study period. At the initial clinic visit, 17.5% had chlamydia, 15% had gonorrhoea, and no active syphilis cases were observed, though 5% had serological evidence of past syphilis. No HIV or active HBV infections were detected. The total observation period was 69.2 person-years, with a follow-up duration per participant presented as the mean (1.73 person-years) and range (0.36–3.82 person-years). A total of 1757 STI tests were conducted, with an average of 25.4 tests per person-year (range: 3.7–58.3).

Incidence rate of STIs during study follow-up

The observation period for STIs was 46.5 person-years before and 22.7 person-years after doxyPrEP initiation. The overall STI

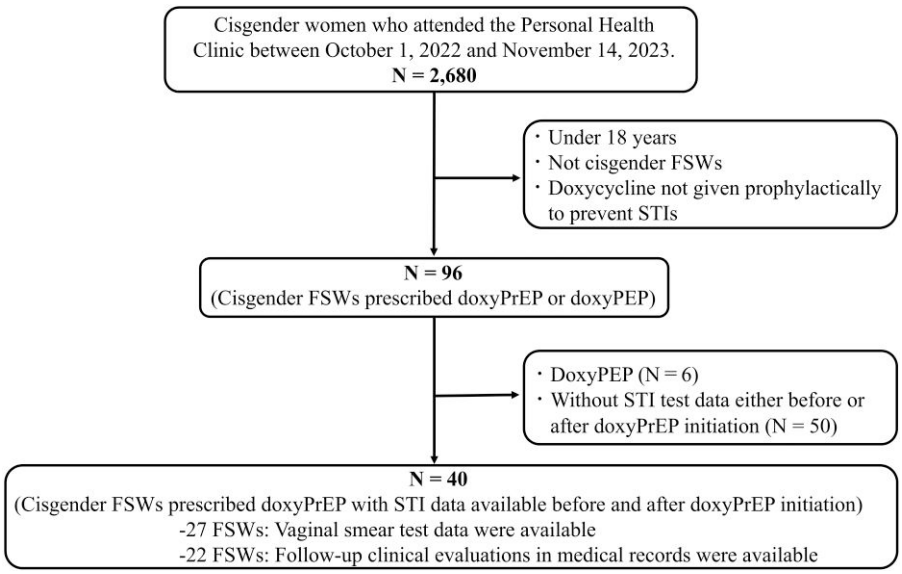

Figure 1. Flow diagram describing inclusion of cisgender FSWs for initiation of doxyPrEP during the study period. STIs, sexually transmitted infections; FSWs, female sex workers; doxyPrEP, doxycycline pre-exposure prophylaxis; doxyPEP, doxycycline post-exposure prophylaxis.

Table 1. Baseline characteristics of the participants ($N=40$)

Variable	N (%)[a]
Age group (years), median (IQR)	29 (26.0–33.5)
18–29	22 (55.0)
30–39	15 (37.5)
40+	3 (7.5)
Ethnicity	
Asian	40 (100)
HIV PrEP	33 (82.5)
Contraceptive pill	35 (87.5)
Prevalence at first visit	
Chlamydia	7 (17.5)
Gonorrhoea	6 (15.0)
Syphilis (active)	0 (0)
Syphilis (prehistory)	2 (5.0)
Bacterial vaginosis (Total $N=14$)	8 (57.1)
Vulvovaginal candidiasis (Total $N=14$)	0 (0)
HIV infection	0 (0)
Active HBV infection	0 (0)
Total observation period (person-years)	69.2
Total number of STI tests	1757
Total number of STI tests/person-years	25.4

HIV, human immunodeficiency virus; HBV, hepatitis B virus; PrEP, pre-exposure prophylaxis; STI, sexually transmitted infection; IQR, interquartile range.
[a]Values are presented as N (%) except as indicated.

Table 2. Incidence rates before and after initiating doxyPrEP

Disease	DoxyPrEP status	Total diagnoses	PYs	IR (/100 PYs)	IRR (95% CI), P value
Overall STIs ($n=40$)	before	108	46.5	232.3	0.33 (0.13–0.84), $P=0.020$
	after	18	22.7	79.2	
Chlamydia ($n=40$)	before	74	46.5	159.2	0.35 (0.12–1.03), $P=0.056$
	after	13	22.7	57.2	
Gonorrhoea ($n=40$)	before	26	46.5	55.9	0.45 (0.15–1.29), $P=0.136$
	after	5	22.7	22.0	
Syphilis ($n=40$)	before	8	46.5	17.2	—
	after	0	22.7	0	
Bacterial vaginosis ($n=27$)	before	36	34.2	105.2	1.19 (0.72–1.94), $P=0.499$
	after	23	16.7	137.4	
Vulvovaginal candidiasis ($n=27$)	before	18	34.2	52.6	1.52 (0.62–3.70), $P=0.358$
	after	12	16.7	71.7	

DoxyPrEP, doxycycline pre-exposure prophylaxis; STI, sexually transmitted infection; PYs, person-years; IR, incidence rates; IRR, incidence rate ratio; CI, confidence interval.

incidence rate significantly decreased from 232.3 to 79.2 per 100 person-years post-doxyPrEP initiation. While the reduction in chlamydia showed marginal statistical significance, syphilis infection dropped to zero, and gonorrhoea showed no statistically significant changes. Similarly, no significant changes were observed in BV or VVC incidence (Table 2). In addition to evaluating the IRR, we assessed test positivity rates (Figure 2). Clinicians tended to perform STI tests more frequently following the initiation of doxyPrEP to closely monitor STIs and adverse effects, as reflected by the increased number of tests per person-year for both STIs and vaginal infections (Table 3). Despite this higher testing frequency, STI test positivity rates declined notably. The test positivity rate for gonorrhoea decreased from 7.5% to 2.2% post-doxyPrEP initiation, although the incidence rate remained unchanged. In contrast, BV or VVC positivity rates showed little to no change. Overall, STI testing frequency increased from 22.7 to 30.9/person-years, while test positivity declined from 10.2% to 2.6%. As for specific infections, chlamydia positivity decreased from 20.7% to 5.7%, gonorrhoea from 7.5% to 2.2%, and syphilis from 2.3% to zero. Despite the increased frequency of Gram staining for BV and VVC, their positivity remained largely unchanged (17.1% to 17.0% and 8.5% to 8.9%, respectively). No participants were diagnosed with HIV or HBV infection during the study period.

Follow-up clinical evaluations from medical records

Follow-up clinical evaluations were collected from the medical records of 22 out of 40 participants (55.0%). Adherence to doxyPrEP was generally high, with most participants reporting no missed doses. The most commonly reported side effects were nausea and vomiting, whereas diarrhoea and genital itching were less frequent. Participants identified several perceived benefits of doxyPrEP, including reduced anxiety about contracting STIs, fewer days off sex work, and a decline in STI incidence. Most respondents indicated no change in condom use frequency after initiating doxyPrEP, with only one reporting an increase and none reporting a decrease (Table 4).

Discussion

Given the considerable increase in congenital syphilis incidence, addressing STIs has become an urgent public health priority. DoxyPrEP significantly reduced the overall STI incidence among cisgender FSWs without increasing the risk of other vaginal infections. It was well tolerated, with high participant satisfaction. These findings suggest that doxyPrEP can serve as an effective STI preventive strategy in cisgender FSWs, a population for whom clinical data remain limited.

An RCT in Kenya previously reported that doxyPEP was not effective in preventing bacterial STIs in cisgender women.[14] However, the present study observed high adherence, which likely contributed to the substantial reduction in STIs. Moreover, regimen-specific factors may also contribute. For example, a PrEP regimen using a daily 100 mg dose of doxycycline may enhance protective efficacy by establishing a routine that minimizes missed doses, with 100 mg being better tolerated than 200 mg.

In this study, the reduction in chlamydia showed only marginal statistical significance. This result may be partly attributed to the small sample size, which likely contributed to the observed

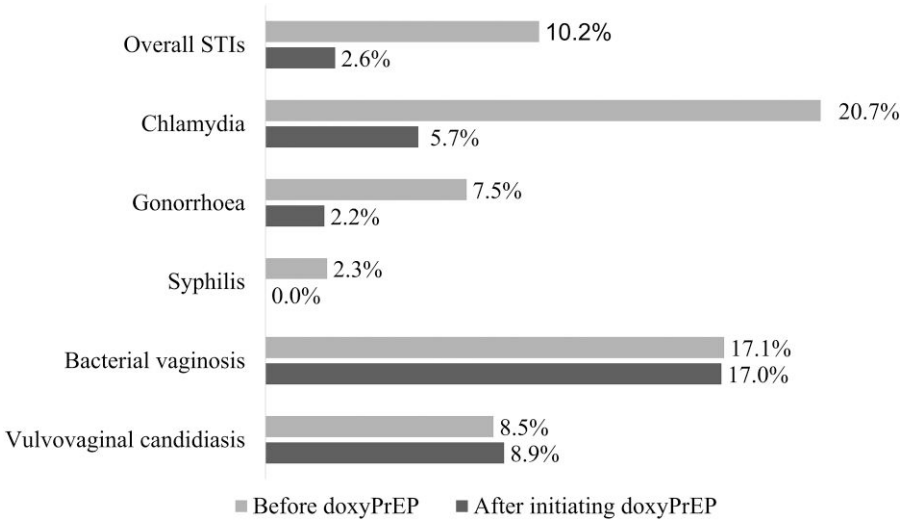

Figure 2. Test positivity rate before and after initiating doxyPrEP indicated that despite increased testing frequency, STI test positivity rates decreased significantly post-doxyPrEP initiation, with overall positivity dropping from 10.2% to 2.6% (gonorrhoea and chlamydia positivity dropping to 2.2% and 5.7% from 7.5% and 20.7%, respectively), while BV and VVC positivity rates remained unchanged. STIs, sexually transmitted infections; doxyPrEP, doxycycline pre-exposure prophylaxis; BV, bacterial vaginosis; VVC, vulvovaginal candidiasis.

Table 3. Number of tests before and after initiating doxyPrEP

Disease	DoxyPrEP status	Number of tests	PYs	Number of tests/PYs
Overall STIs	before	1055	46.5	22.7
(*N* = 40)	after	702	22.7	30.9
Chlamydia	before	358	46.5	7.7
(*N* = 40)	after	230	22.7	10.1
Gonorrhoea	before	348	46.5	7.5
(*N* = 40)	after	231	22.7	10.2
Syphilis	before	349	46.5	7.5
(*N* = 40)	after	241	22.7	10.6
Bacterial vaginosis	before	211	34.2	6.2
(*N* = 27)	after	135	16.7	8.1
Vulvovaginal candidiasis	before	211	34.2	6.2
(*N* = 27)	after	135	16.7	8.1

DoxyPrEP, doxycycline pre-exposure prophylaxis; PYs, person-years.

lack of significance. Another factor that may have influenced this finding is the frequency and timing of STI testing. Typically, a test of cure is not recommended for chlamydia, except in pregnant women or under specific circumstances; even in such cases, the use of TMA testing for Chlamydia within four weeks of therapy is discouraged.[16,17] This observed difference in effectiveness may be partly due to shorter testing intervals after initiating doxyPrEP, combined with the persistent presence of chlamydial DNA, which can lead to false-positive results. In Japan, many FSWs are required to undergo regular STI testing approximately once every one to three months to confirm they are free of infection in order to continue working. However, after initiating doxyPrEP, clinicians tended to perform STI tests more frequently to monitor potential side effects, which may have increased the likelihood of false-positive results.

The efficacy of doxycycline prophylaxis against gonorrhoea should also be evaluated in the context of local resistance patterns. A 2015 surveillance study in Japan reported that 72.7% of *N. gonorrhoeae* strains were not susceptible to tetracycline.[18] In contrast, a 2019 analysis of *N. gonorrhoeae* isolates from the US found that 27.6% were resistant to tetracycline,[19] indicating a relatively higher resistant rate in Japan. This higher level of tetracycline resistance may have contributed to the limited effectiveness of doxyPrEP in preventing gonorrhoea. Cultures are typically performed in cases of persistent *N. gonorrhoeae* positivity. However, in this study, no instances of persistent positivity were observed, and thus, cultures were not performed. As a result, the antibiotic resistance profile of *N. gonorrhoeae* in this clinic could not be assessed. It remains unclear whether this low susceptibility contributed to the lack of prophylactic efficacy against gonorrhoea or if an insufficient doxycycline dose played a role.

Although the observation period was relatively short, no cases of syphilis were detected in this clinic during the study period. However, this result should be interpreted with caution, as the absence of cases may have occurred independently of any biomedical intervention, given the limited sample size.

Despite an increase in overall testing frequency by less than 50%, a substantial reduction in test positivity for most STIs was observed, with an overall decline of more than threefold (from 10.2% to 2.6%). This trend was consistent across individual infections, including chlamydia, gonorrhoea, and syphilis, suggesting a meaningful reduction in infection burden associated with doxyPrEP implementation. However, test positivity rates for BV and VVC did not follow the same pattern, potentially reflecting differences in the underlying microbiological and ecological dynamics of these infections.

Table 4. Follow-up clinical evaluations from medical records

Response ($N=22$)	Count	%
Adherence to doxyPrEP		
No missed doses (100%)	16	72.7
Missed doses 1–2 times/month	6	27.3
Missed doses >3 times/month	0	0
Side effects[a]		
Nausea and vomiting	5	22.7
Genital itching	3	13.6
Diarrhoea	1	4.5
Condom use frequency		
No change	21	95.5
Increase	1	4.5
Decrease	0	0
Benefits and concerns[a]		
Reduction in anxiety about STIs	16	72.7
Reduction in the incidence of STIs	16	72.7
Decrease in days off from sex work	7	31.8
Cost	8	36.4

doxyPrEP, doxycycline pre-exposure prophylaxis; STI, sexually transmitted infection.
[a]Multiple answers allowed.

Long-term use of doxycycline has been associated with moderate transient effects on oral, respiratory, and gastrointestinal flora.[20] However, data on its effect on the vaginal flora of cisgender women remain limited. Although antibiotic use is commonly linked to an increased risk of BV and VVC,[21,22] the use of doxyPrEP in this study did not appear to influence the incidence or positivity rates of these infections. None of the FSWs discontinued doxycycline because of BV or VVC, suggesting that daily oral administration may not significantly disrupt normal vaginal flora. Although some concerns regarding tolerability exist, long-term administration of doxycycline use has generally been shown to be safe.[23] In this study, 20.8% of the participants reported nausea and vomiting; nevertheless, nearly all continued treatment by adhering to a postprandial administration regimen, with only one FSW discontinuing treatment due to nausea. No allergic reactions or serious adverse events, including drug-related rashes, were observed. Comprehensive data on condom use, HIV PrEP, doxyPEP, and doxyPrEP among Japanese FSWs remain unavailable. Condom use may not always be practised or feasible in this population and can vary depending on the type of sexual activity, such as vaginal intercourse or oral sex.

This study had several limitations. First, it was a single-centre retrospective analysis with a small sample size and short observation period, which may have reduced statistical power and introduced biases. Nevertheless, a substantial reduction in STIs was observed, suggesting a possible effect of doxyPrEP. Second, the absence of syphilis diagnoses may not fully reflect the intervention's impact. Third, behavioural data were available for only 22 participants, limiting the ability to assess changes in sexual behaviour comprehensively. Another key limitation is the difference in testing rates before and after doxyPrEP initiation. Increased testing frequency may have led to the detection of more asymptomatic infections, variations in testing intervals could have influenced incidence calculations. Despite these limitations, we adjusted for individual variability in our analysis and reported both incidence and test positivity rates to provide a more comprehensive assessment of doxyPrEP's effects.

Conclusions

In this study, the pre-exposure prophylactic doxycycline regimen (doxyPrEP) significantly reduced the overall incidence of STIs among cisgender FSWs without increasing the incidence of other vaginal infections. No serious doxycycline-related adverse effects were observed, and participant satisfaction with doxyPrEP was notably high. However, these preliminary results should be interpreted with caution due to the study's limitations. Further large-scale, controlled studies are needed to validate these findings, assess long-term effectiveness, and evaluate the potential impact on antibiotic resistance and broader public health implications.

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Transparency declarations

The authors declare no conflicts of interest. The data supporting this article are available on reasonable request from the corresponding author. D.M. and D.S. conceived and designed the study. S.A., A.K., H.U. and D.S. collected data. S.A., D.M. and N.A. analysed and interpreted the data. S.A. wrote the paper. H.M., T.K., H.G., S.O. and D.S. supervised the study. All authors have read and approved the manuscript.

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